APRIL, 1953

TOOLING and PRODUCTION

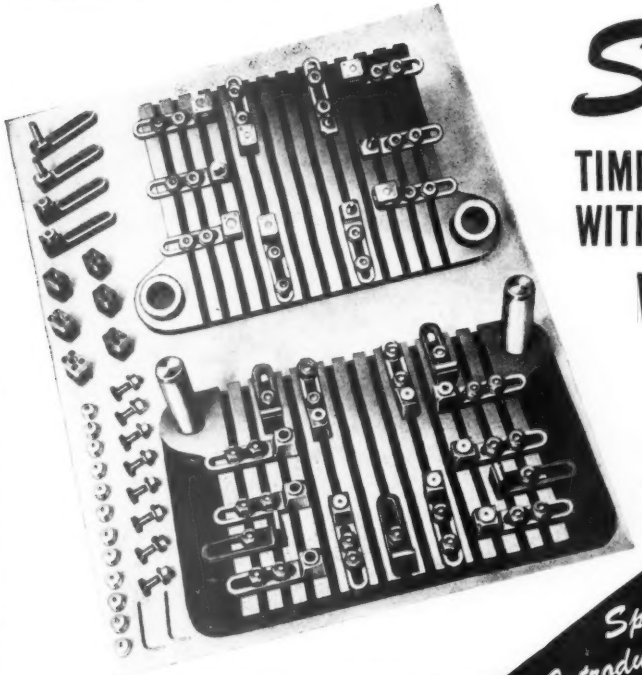
The Magazine of Manufacturing Management

To Change Address
See Bottom of the
Inform-A-Gram Page

THIS COPY
BELONGS
TO

RETURN POSTAGE GUARANTEED

FORM 3547
REQUESTED



Save

TIME AND MONEY WITH THIS NEW WHISTLER U-375 Adjustable Perforating DIE SET

Special Introductory Offer

To prove the advantages of Whistler Adjustable Dies under your production conditions, we are offering these U-375 units at a special low price.

- 1 DS-1012-1 (10" x 12") T Slotted Die Set
- 12 DR-375 Die Retainers
- 12 PR-375 Punch Retainers
- 12 PU-375 Round Punches
- 12 DBU-375 Die Bushings
- 12 S-375 Strippers
- 12 LLP-375 Locating Pilots
- 4 GA-375 Standard Gauges
- 1 SUP-375 Set-Up Plug

Punches and dies are your own selection of sizes from 1/32" up to 3/8" diameters. Everything needed to start production is included.

Shipped complete upon receipt of your order for only **$280**

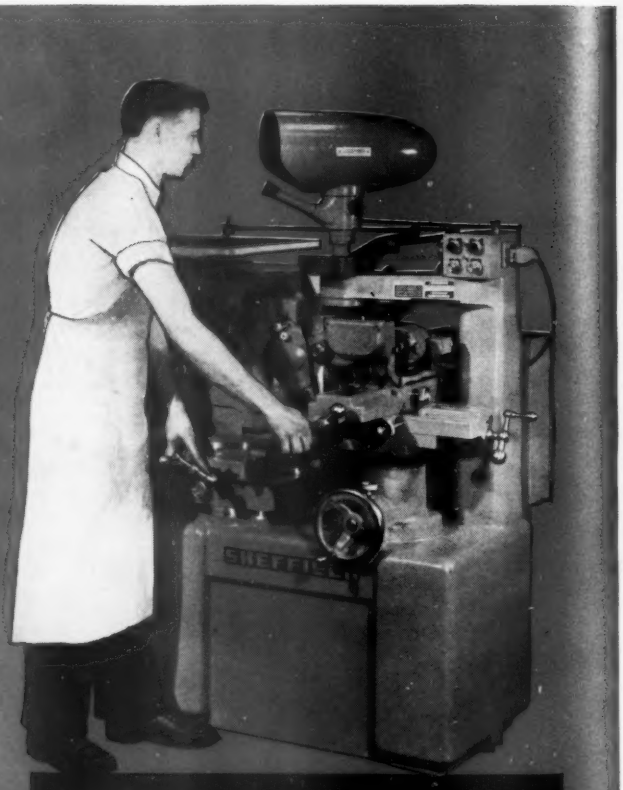
A money-saving opportunity to prove in your own plant the many advantages of Whistler Adjustable Dies. Now being employed by thousands of metal working shops. The compact design of this special U-375 unit (10"x12" working surface) provides up to 25 holes, 1/32" to 3/8" diameter. Pierce materials up to and including 1/16" mild sheet steel . . . in one operation. Minimum centers of 7/8" are permitted. Set-ups are made quickly and into production within hours. Precision perforating on long or short runs at much reduced expense. Re-use of punches and dies writes off first cost. The U-375 unit is shipped complete ready for immediate set-up.

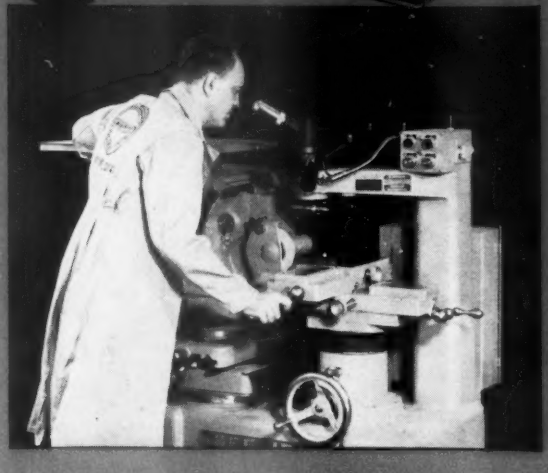
SENT FREE ON REQUEST

Special U-375 Booklet and General Catalogs
In brief informative style, with clear-cut illustrations, this literature gives complete details about Whistler Adjustable Dies. Write today.

S. B. WHISTLER & SONS, INC.
748 Military Road — Buffalo 17, New York

Grind High Precision Profiles Directly from the Drawing *with* SHEFFIELD'S MICRO-FORM GRINDER





Features

- Grinds both flat and circular profiles
- No restrictions on profile intricacy
- No templates needed
- Perfect toolroom accuracy
- Saves up to 75% on profile work
- Final accuracy checked while work is still on the grinder
- Accuracy not affected by wheel wear
- No special wheel dressing required as wheel can be set at any angle—fewer wheels are needed
- Diamond impregnated wheels used in grinding carbides last longer—no waste as no special dressing is required
- Multiple work parts ground simultaneously
- Grinds any material including carbides
- Controlled by 50:1 pantograph and 30 power scope and viewing screen

For full details and specifications ask your Sheffield representative for Bulletin MFG-122-51 or write us direct.

6113

the **Sheffield** corporation

DAYTON 1, OHIO, U.S.A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

Representatives in Principal Countries • In Australia, the Sheffield Corp. of Australia Pty. Ltd., Melbourne

Three Reasons Why . .

1 Reduce set-up and change-over time required on large tapered shank tools.

2 Versatility—drilling, reaming and other operations can be done with same set-up, using Postiv-Lok adapters.

3 Eliminate need of integral tapered shanks. Tools cost less.

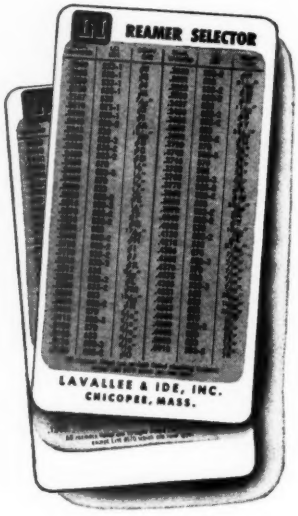
Write on your letterhead for new catalog.

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

NOW L&I makes REAMER SELECTION EASY...



This sturdy pocket size Reamer Selector is a must for buyers and users of reamers. It lists 143 hole sizes from .0400 thru .5010 which can be reamed with STANDARD L&I Reamers. Includes catalog numbers and equivalent sizes for easy ordering.

Mail the coupon and your L&I Distributor will get your Selector to you.

L&I *The Reamer Specialists*

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

I'd like _____ Reamer Selectors
_____ New Catalogs _____ Net Price Lists.

Name _____ Pos _____
Company _____
Street _____
City _____ Zone _____
State _____

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly
Tool-Die-Machine PROGRESS 1934-41
TOOL & DIE JOURNAL 1941-51

Vol. XIX—No. 1 April, 1953

CONTENTS

Editorial Index 42
Editorial 45
Publication Previews 94
Men You Should Know 110
Inform-A-Gram Card 131
Progress On Parade 135
Quick Pic 151
Shop Aids 157

EDITORIAL STAFF

GEORGE J. HUEBNER . . . . . Editor-in-Chief
E. WILLARD PENNINGTON . . . . . Editor
C. F. BENNER . . . . . Assistant Editor
W. N. NORDQUIST . . . . . Technical Editor
M. A. L. WEBSTER . . . . . Editorial Assistant
A. H. EHLERS . . . . . Contributing Editor

MEMBER OF CCA

TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our CCA verification.

U. S. rate of subscription for schools, libraries and individuals other than above, is $6.50 per year. Foreign subscription is $10.00 per year, and single copies are $.75.

Copyright 1953 by Huebner Publications, Inc.

Acceptance under section 34.64, P. L. and R. authorized at Louisville, Kentucky.

BUSINESS STAFF

G. J. HUEBNER . . . . . Publisher
R. L. HUEBNER . . . . . Business Manager
R. R. SCOTT . . . . . Production Manager
E. N. DeCAPRIO . . . . . Contract Manager
B. C. JACKSON . . . . . Research Manager
E. J. BROOKS . . . . . Sales Development Manager
E. C. JOHNSON . . . . . Circulation Manager

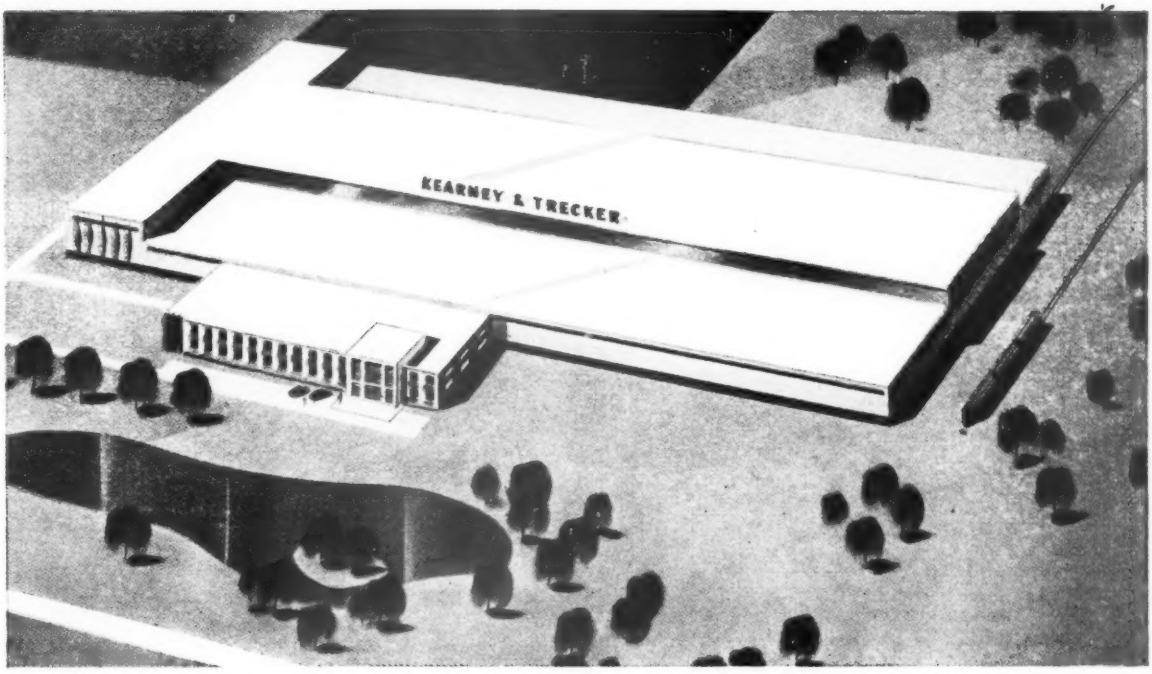
REGIONAL REPRESENTATIVES

ALTEDENA, CALIF., M. D. Pugh, 2721 N. Marengo Ave. . . SYcamore 7-2894
CHICAGO 1, Robert R. Pierson, 333 N. Michigan Ave. . . . . FRanklin 2-4811
CLEVELAND 18, Jerry J. Miller, 1975 Lee Road . . . . . FAirmount 1-4040
DETROIT 2, R. F. Pickrell, 314 Stephenson Bldg. . . . . TRinity 1-0790
NEW YORK 17, H. Thayer Heaton, 141 East 44th St. . . . MUrray Hill 2-1647

Published monthly by
HUEBNER PUBLICATIONS, INC.
1975 LEE ROAD • CLEVELAND 18, OHIO
FAirmount 1-4040

GEORGE J. HUEBNER . . . . . President
R. L. HUEBNER . . . . . Secretary
R. R. HUEBNER . . . . . Treasurer

PUBLISHERS OF
Tooling and Production ★ Die Designing and Estimating ★ Plastics Molds
The Know-How-Library of Tooling and Production



Here it is! Kearney & Trecker's new Special Machinery Division — nearly 200,000 sq. ft. of new plant with new tools and equipment. An experienced, fully-staffed team of sales, engineering and production experts is ready and waiting to serve you . . . by engineering new production methods.

INCUBATOR . . . for Production Ideas

This plant is being built for you . . . to engineer *new* production methods — to build the large or small special machines, tools and fixtures you need to improve production and cut costs.

Production behind schedule?

Costs going up, up and up?

Will special machines, special tools and fixtures or special arrangements of standard machines help you solve these problems?

Then why not be among the first to take advantage of the 5-million-dollar-plus investment that Kearney & Trecker is making in new plant, new tools and new engineering to help you solve them.

Kearney & Trecker *is no newcomer* to the field of special machine tools and allied special equipment. During the past 50 years millions of dollars worth of Kearney & Trecker special machinery has been produced for plants all over the world. And that doesn't include the 60,000 standard Kearney & Trecker milling machines and other machine tools so well known and so widely accepted everywhere.

Kearney & Trecker is already working on new production ideas, new equipment and tool designs to be produced in this plant. Kearney & Trecker Special Engineering and Methods Analysts are ready right now to serve you with (1) Prompt response to your inquiry, (2) Immediate engineering help on your problem, plus, (3) The newest, finest and most complete facilities to build the special equipment you need — big or small.

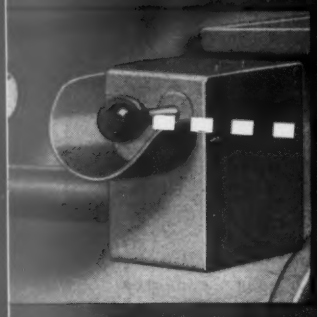
Phone, write or wire The Special Machinery Division, Kearney & Trecker Corporation, Milwaukee 14, Wis., today. Get the facts about Kearney & Trecker's Special Machinery Division and how it can serve you.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

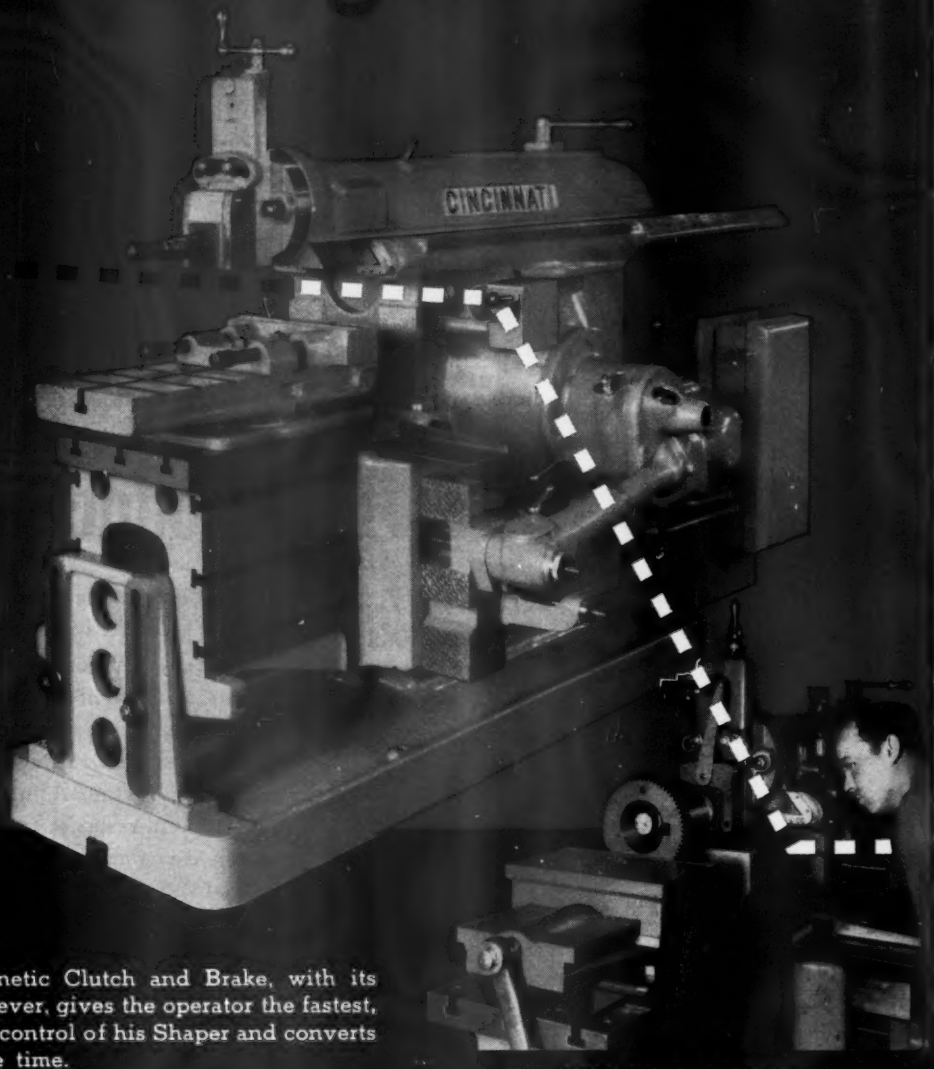
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Outstanding Time Saving...

...Outstanding ACCURACY



Single Control Lever



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-5.

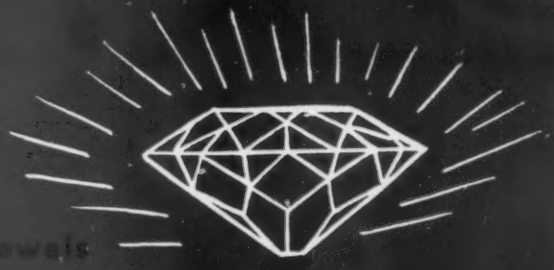
30% Time Saving

Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. • SHAPERS • SHEARS • BRAKES

THE "Kohinoor" DIAMOND always stands out among jewels



in

PUSHERS

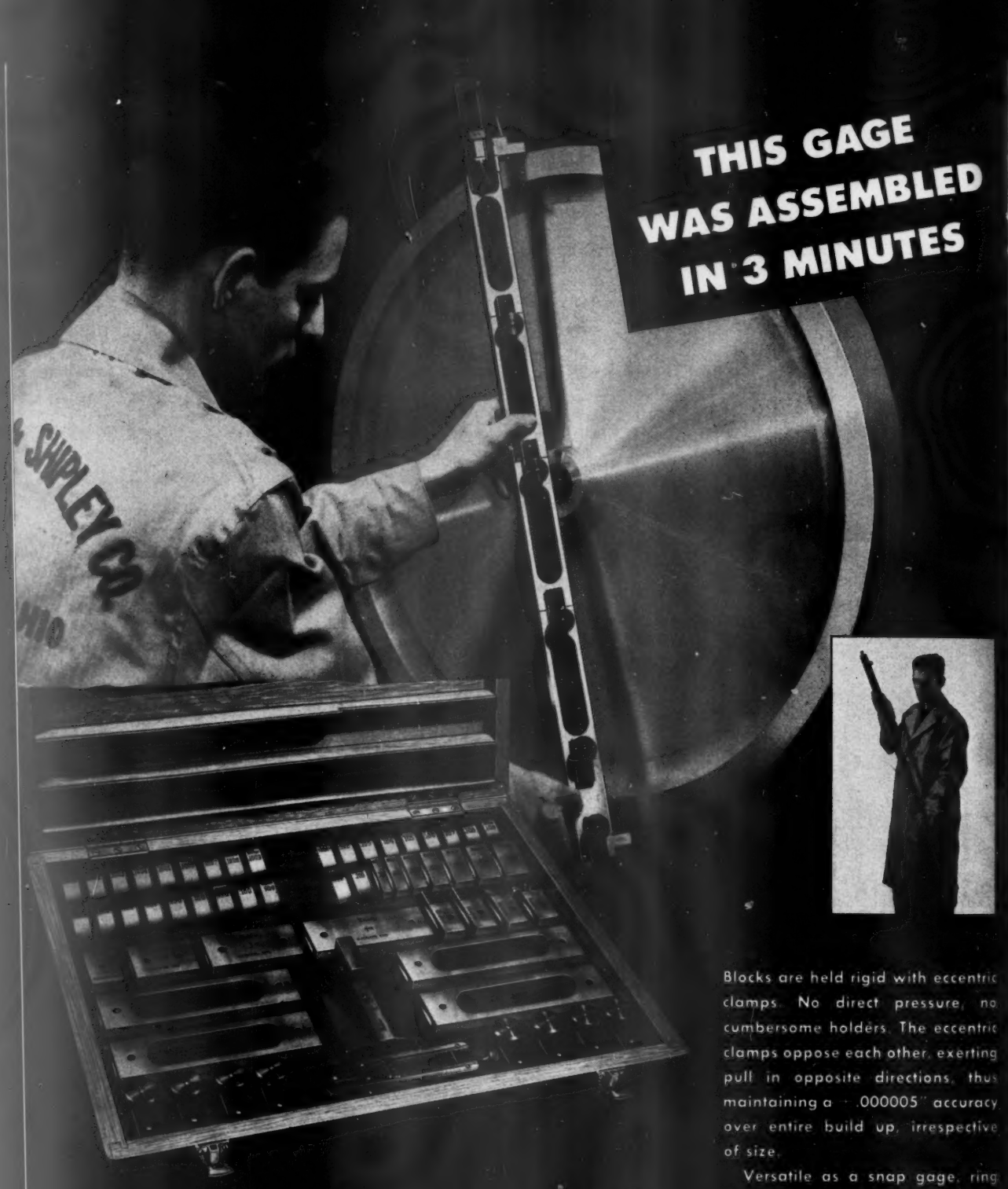
it's

BALAS

For maximum feeding efficiency and reduced stock waste Balas Pushers and Feed Fingers consistently prove themselves outstanding. Balas Pushers, made in the widest variety of styles and sizes, give you better production at lower unit cost... increased output from both operators and machines. Investigate the advantages of these accurate, dependable Balas Pushers; you will find it profitable to use them on all your screw machines and lathes.

BALAS COLLET MANUFACTURING COMPANY
CLEVELAND 14, OHIO

WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY



THIS GAGE WAS ASSEMBLED IN 3 MINUTES

Blocks are held rigid with eccentric clamps. No direct pressure, no cumbersome holders. The eccentric clamps oppose each other, exerting pull in opposite directions, thus maintaining a .000005" accuracy over entire build up, irrespective of size.

Versatile as a snap gage, ring gage, height gage and scriber. Infinite in its range.

Write for literature on Webber H.D. Gage Blocks and Fixtures.

Webber

HEAVY DUTY GAGE BLOCKS and FIXTURES

WEBBER GAGE COMPANY
12903 Triskett Road, Cleveland 11, Ohio

Largest exclusive manufacturer of gage blocks.

GORTON *Brings You* High Production

Automatic Profiling of CAMS AND CAM-LIKE SHAPES

Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

CAPACITY . . .

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

EXTREME ACCURACY . . .

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

CUSTOM-DESIGNED . . .

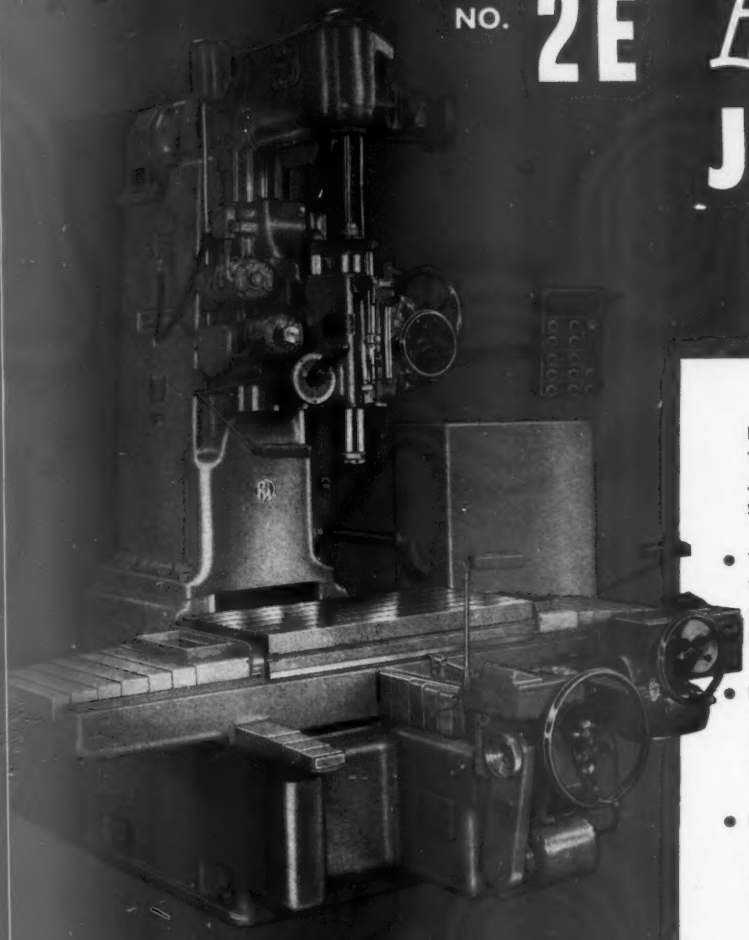
The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2390-C-1204.

GEORGE GORTON MACHINE CO.

1204 RACINE STREET • RACINE, WISCONSIN, U. S. A.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

THE NEW PRATT & WHITNEY NO. 2E *Electrolimit* JIG BORER



BRINGING THESE OUTSTANDING ADVANTAGES OF THE PRATT & WHITNEY SERIES "E" *ELECTROLIMIT* JIG BORERS TO YOUR MANY SMALL AND MEDIUM SIZED, HIGH-PRECISION JOBS

- THE NEW P&W *Electrolimit* MEASURING SYSTEM
  This entirely new method of locating the table is extremely fast, accurate and easy to use. Wear is eliminated and the high original precision is retained indefinitely.

- EXCLUSIVE PRECISION PRELOADED BALL ROLL QUILL
  The hardened, ground and lapped spindle quill "roll-feeds" in a preloaded ball roll mounting. Accuracy to "tenths" is assured indefinitely without maintenance or adjustment.

- P&W OPEN SIDE CONSTRUCTION
  Large, irregular shaped work pieces are handled with a convenience and speed impossible with any other type of jig borer construction.

- AMPLE CAPACITY
  Table working surface is 22" x 44", longitudinal travel 36" and transverse travel 22". Table top to spindle end, maximum, is 27"; special columns 6" and 10" higher than standard can also be supplied.

Other PRATT & WHITNEY *Electrolimit* JIG BORERS

NOW IN PRODUCTION:

THE 1E — Compact and versatile with table sizes of 12" x 24" and 12" x 42".

THE 4E — Largest precision jig borer built with 36" x 72" rectangular table or combination rectangular and built-in 48" rotary table.

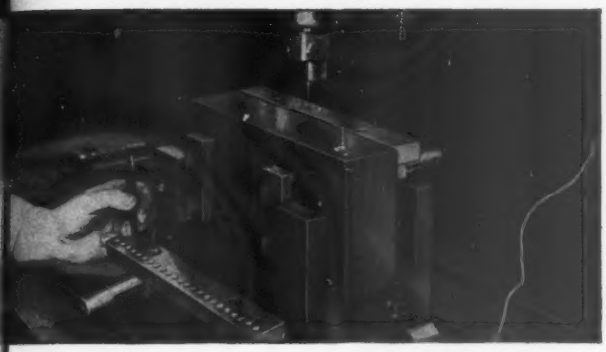
AND ON THE WAY:

THE 3E — Intermediate capacity with a 28" x 56" table.

Machining of components for this big die, 48" square, is handled with a P&W 20" Rotary Table on a Pratt & Whitney Jig Borer. A total of 160 holes on the die ring and punch pad are drilled and bored to a tolerance of ±.0001" making possible a uniform fit in any combination of assembly.

Here a casting is precision machined on a P&W Jig Borer with a P&W Tilting Rotary Table. Using only ordinary hold-down clamps, 13 holes are bored, 2 surfaces faced and 3 more surfaces precision milled *in a single setup.* No special fixtures are required.

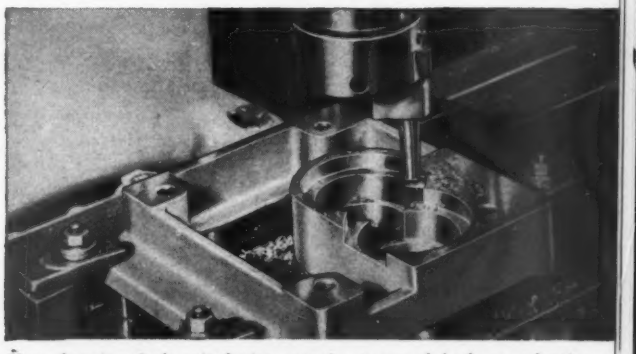
YOU CAN PUT *Performance like this* TO WORK IN *Your Plant*



One of these punch and die bars requires 23 holes .1875" in diameter; the other requires 23 holes .3120" in diameter. Using a P&W Jig Borer, they are all single point bored to a tolerance of +.0000", —.0002"; center distances of .5000", ±.0002" and a permissible accumulated error of only ±.0005"

Extreme, dependable accuracy is a "must" in the Aviation Industry. That's why a Pratt & Whitney Jig Borer is used to machine the aluminum alloy aircraft engine part to "tenths" limits. Operations include drilling, boring, facing and precision milling.

Machining this big Meehanite casting for a hydraulic pump, calls for five holes approximately 5" in diameter, precision bored to a tolerance of .0005" for spacing and hole size. A Pratt & Whitney Jig Borer does the job rapidly, dependably, economically.



Shown here is a single point boring operation on one of the four overlapping holes in a machine gear box adapter. The four diameters in each of these two bearing seats are precision bored to a tolerance of .0005" using a Pratt & Whitney Jig Borer.

Write on your Company letterhead for Cir. No. 559.

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice for *Accuracy*

BRANCH OFFICES . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanton Co.) • DETROIT • HOUSTON (The Stanton Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

MACHINE TOOLS • CUTTING TOOLS • GAGES

SIZE IDENTIFIED ASSEMBLY SIMPLIFIED

The Only

SIZE-MARKED GEAR GRIP SOCKET HEAD CAP SCREW

The size is clearly incised on the head, can be seen at a glance. It prevents errors by "green" workers, helps veterans also to speed assembly. It saves time and wasted screws when sizes get mixed up.

It's a sales feature for your product. Your customers' maintenance men will like the Size-mark . . . it aids them in reassembling after servicing. Gear Grip prevents slips, speeds work, even when fingers are oily.

Since there is no better Socket Head Cap Screw made, why not get these important extra features offered only by P-K? Ask for samples. Parker-Kalon Corp., 200 Varick St., New York 14, N.Y.

FOR ANY TYPE SOCKET SCREW—
REMEMBER

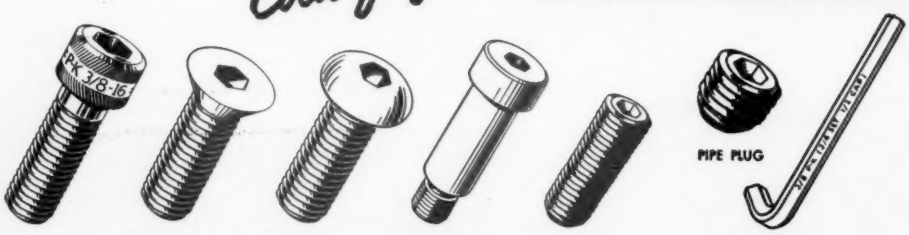
IF IT'S P-K IT'S O.K.

TRADE MARK REG. U.S. PAT. OFF.

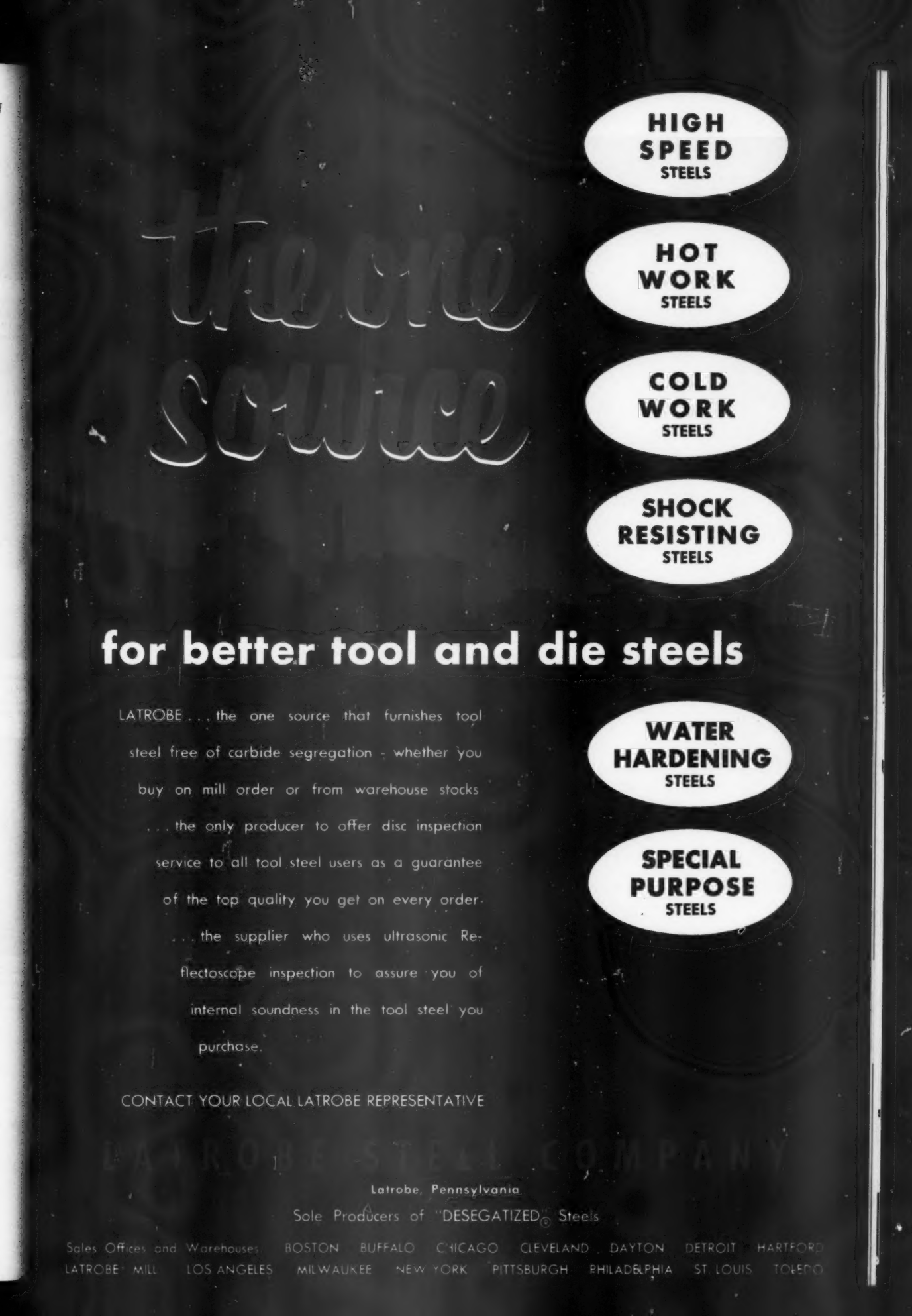
Sold through Industrial Distributors, the Supply Specialists that serve you

PARKER-KALON®

Cold-forged SOCKET SCREWS



FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD



for better tool and die steels

LATROBE . . . the one source that furnishes tool steel free of carbide segregation - whether you buy on mill order or from warehouse stocks . . . the only producer to offer disc inspection service to all tool steel users as a guarantee of the top quality you get on every order . . . the supplier who uses ultrasonic Reflectoscope inspection to assure you of internal soundness in the tool steel you purchase.

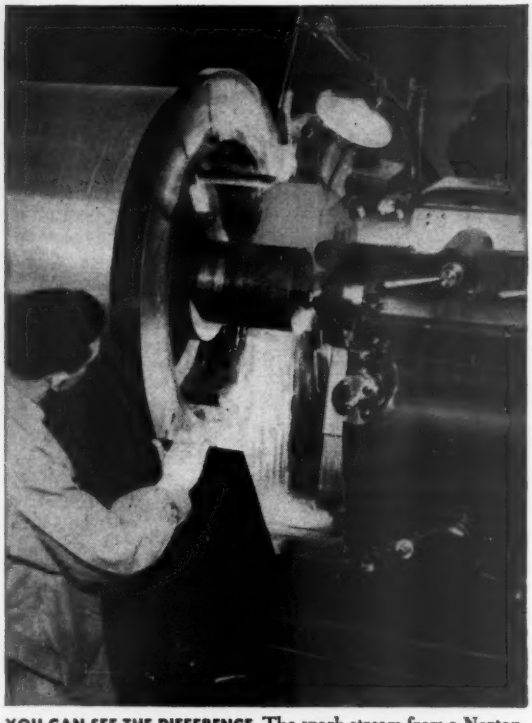
CONTACT YOUR LOCAL LATROBE REPRESENTATIVE

LATROBE STEEL COMPANY

Latrobe, Pennsylvania

Sole Producers of "DESEGATIZED"® Steels

Sales Offices and Warehouses: BOSTON BUFFALO CHICAGO CLEVELAND DAYTON DETROIT HARTFORD LATROBE MILL LOS ANGELES MILWAUKEE NEW YORK PITTSBURGH PHILADELPHIA ST. LOUIS TOLEDO



YOU CAN SEE THE DIFFERENCE. The spark stream from a Norton G Bond ALUNDUM wheel is more continuous, more even, indicating uniformity of wheel structure and of cutting action.

YOU CAN HEAR THE DIFFERENCE. Norton G Bond wheels grind with the pleasant, steady swish-h-h of free, easy cutting. You hear no harsh grinding noise.

YOU CAN PROVE THE DIFFERENCE. From general purpose to high production work, every job you do with the new G Bond wheels will benefit by the unique cutting action that grinds faster, freer, and cooler.

"TOUCH OF GOLD"

NOW!... Boost your profits with the NEW

G BOND

for your latest Norton value-adding

"TOUCH OF GOLD"

It took five years of continuous research and field-testing to bring you the new, exclusive Norton G Bond.

Now the most efficient vitrified bond ever produced is ready to add your latest "Touch of Gold" for increased product-value — and profits — in a wide range of precision and semi-precision grinding jobs.

Secret of the new G Bond's great superiority is the way it holds each abrasive grain for maximum cutting action. Then, *just when it should,* it lets go, assuring a constant grinding surface of new grains with fresh, sharp cutting edges. It is designed to do this better than the bond in any wheel you have ever used before.

As a result, Norton ALUNDUM* grinding wheels made with the new G Bond have definite advantages that you can *see* and *hear* as they grind — and that are *proved* in the better work they turn out for less cost.

That's your newest "Touch of Gold" developed by Norton to help boost your profits and keep your operators happy. Make sure you add it to your production. And remember, only Norton offers you over 65 years of experience in abrasives, grinding wheels and grinding and lapping machines.

SEE YOUR NORTON DISTRIBUTOR

about arranging a test of the new G Bond ALUNDUM wheels in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

THE "TOUCH OF GOLD" IS JOB-PROVED. During extensive field-testing, the new Norton G Bond wheels have made a big hit with operators experienced in many types of grinding. Why not get first-hand reports on these radically improved wheels? Try them in your own shop.

7 BIG ADVANTAGES Norton G Bond ALUNDUM Wheels:

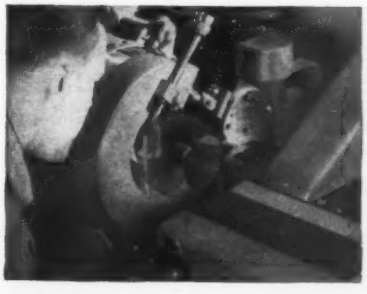
- Do more work per wheel
- Cut freer, cooler, faster
- Dress easier — more pieces per dressing
- Cover a wider range of jobs
- Hold shape — better for form grinding
- Hold corners better
- Ideal for crush dressing

NORTON ABRASIVES

Making better products to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

W-1475



BROAD USEFULNESS. The new Norton G Bond ALUNDUM wheels can boost your profits on many types of grinding, especially cylindrical, centerless, surface, internal, gear, tool and cutter, form and thread grinding, and saw gumming.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Miller HIGH PRESSURE HYDRAULIC CYLINDERS

HARD CHROME PLATED PISTON RODS

Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS

Eliminate Breakage

DIRT WIPER SEALS

Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

DELIVERY

Our normal delivery is now 8 to 10 weeks or longer whenever possible. However, we can make occasional deliveries to meet your RUSH cylinder requirements as follows:

Standard Models except as noted below	4-5 weeks
Models 81 and 82	6-7 weeks
Water-Fitted Models	7-8 weeks
Precision Seal and other "Specials"	8-9 weeks or longer

All Delivery Promises Are Dated From Our Receipt of Complete Information At Our Plant

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

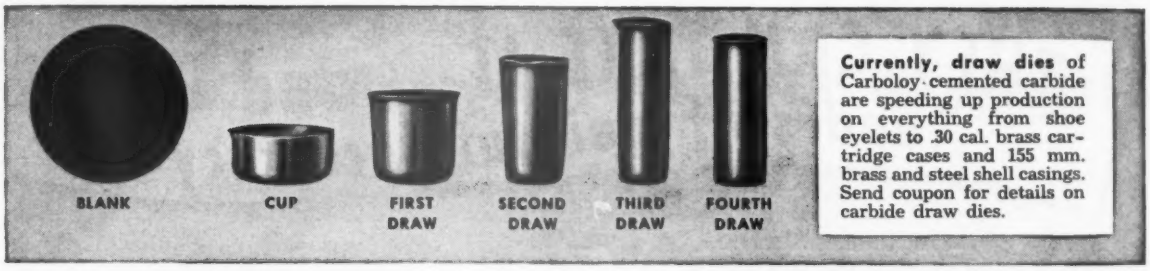
CLEVELAND • YOUNGSTORN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHE AREAS.

Miller

MILLER MOTOR COMPANY

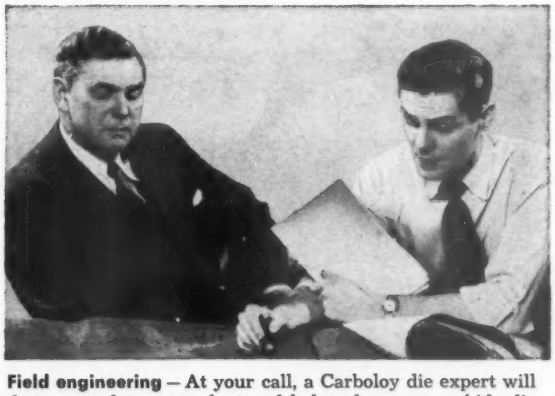
2046 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS



Currently, draw dies of Carboloy cemented carbide are speeding up production on everything from shoe eyelets to .30 cal. brass cartridge cases and 155 mm. brass and steel shell casings. Send coupon for details on carbide draw dies.

Carbide dies outdraw steel dies 10 to 20 times on shell cases



Field engineering – At your call, a Carboloy die expert will drop around to your plant and help solve your carbide die problems. Call him whenever you want on-the-spot answers on design and application of carbides in dies.

Die training school – Courses in design, application and maintenance of carbide dies are given free at Carboloy Die School. Plan to enroll your men now. Send coupon for information.

Dies equipped with Carboloy cemented carbide really stand up in production of steel shell cases. Even under terrific hour-after-hour continuous drawing, they wear 10 to 20 times longer than steel dies and deliver an extremely high finish.

Other drawing applications – similar benefits. Such benefits are not unusual from Carboloy drawing dies. On some applications, they'll outwear other dies by 50 to one. The same holds true for blanking, forming and piercing dies made of Carboloy cemented carbide.

Naturally, when dies wear like this, you get greater production with less downtime and maintenance . . . fewer rejects and less finishing . . . cash savings all down the line.

Whether you make or use press dies, simple or complex, for any die operation, explore the possibility of applying Carboloy cemented carbide to those dies. You can order Carboloy cemented carbide in finished or in rough form from Carboloy Department. On blanking dies, order rough carbide direct from Carboloy Department to be finished in your own or tool maker's die room. Expert Carboloy die specialists will assist you in carbide die design and application.

To get a better idea of the wide range of carbide dies and free Carboloy die services, send coupon.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

Check and Mail Today

Carboloy Department of General Electric Company
11111 E. 8 Mile Street, Detroit 32, Michigan

- ☐ Rush me free Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on Carboloy Die School.
- ☐ Have a Carboloy field representative call at my plant.

Name_____ Position_____

Company_____

Address_____

City_____ Zone____ State_____

"Carboloy" is the registered trademark of the Carboloy Department of General Electric Company

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

THEY CAN TAKE IT...and DO!
...and still maintain accuracy

STANDARD *Dial Indicators*

Built to stand the knocks—often unavoidable

NEW-with Years of Service Ahead

REGULAR AGD SERIES

AGD SPECIFICATIONS THROUGHOUT

Made in 22 models including 4 dial diameters, 7 different graduations. Also 90° models (stem perpendicular to back). Long Range and Long Stem types.

***Decimatic* SERIES**

AGD SPECIFICATIONS except Range and Marking

For especially fine checking, extra high repeatability and accuracy. Marked in decimals. No whip of hand. 16 models.

This One Was New...

Years Ago -

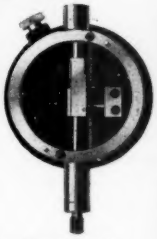
Still Serviceable

Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.

Outstanding Reason for the Durability Built into Standard Indicators is the

SHOCKPROOF MECHANISM



Proved by experience to prolong instrument life greatly, Standard's Shockproof Mechanism protects internal parts right from the spindle on. Furnished regularly in most models, not treated as an optional extra. Standard Indicators give longer, trouble-free life, need fewer repairs, are dependable. These facts add up to "Greater Economy."

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Know the best way to get the best tube steel for you? Ask the experts!

This month's report is on:

SICROMO 2

Has outstanding surface and structural stability at 1200°F. Has better oxidation and corrosion resistance than 2¼ Cr.-Mo. steel. Recommended for service up to 1200°F. as tubes in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping. Also as return-bend forgings for oil heaters.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

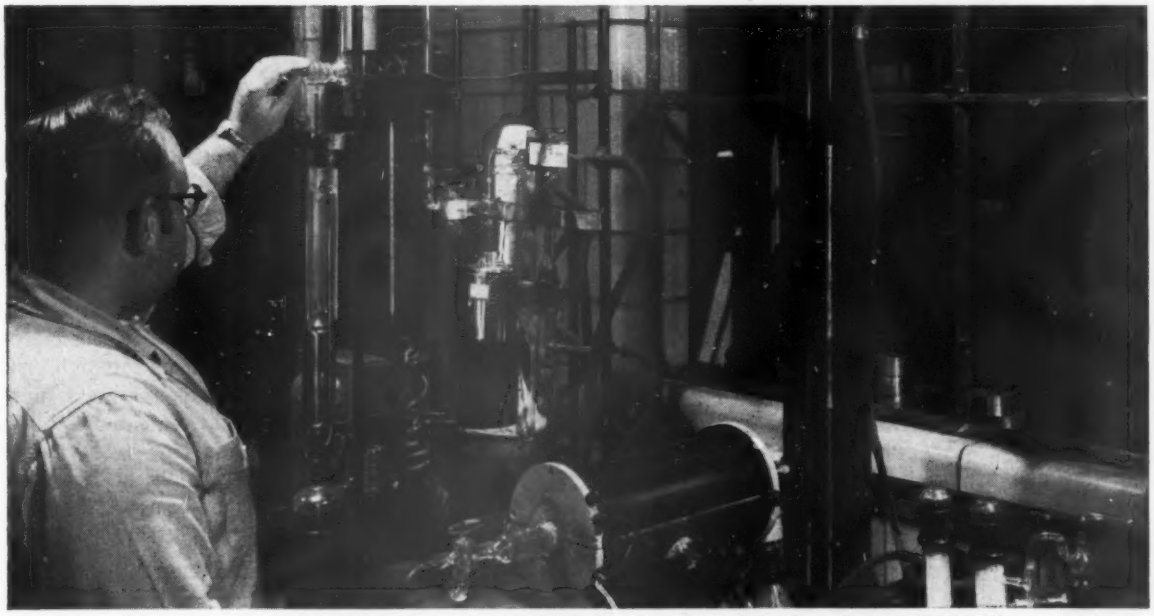
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2¼ Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

SEVERAL high temperature tube steels may solve your heat, pressure, corrosion and oxidation problems. But only one steel will give you maximum tube life per dollar —the best life/cost ratio.

The best way to get this steel is to ask the experts—the metallurgists of The Timken Roller Bearing Company. Backed by more than 20 years of steel research and experience, they're recognized authorities on high temperature steels. With 24 different analyses to choose from, they'll help you select the best tube steel for your particular application. And uniform tube quality is assured by the Timken Company's rigid quality control from melt shop through final tube inspection.

Let our "RSQ"—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Chlorination apparatus purifies extracted non-metallic residues to determine steel cleanliness. Research like this helps assure the Timken Company's leadership in high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

SAVE HOURS in finishing time

with LIQUAMATTE wet blasting

Tools, dies, molds, engine parts, etc. requiring 1 to 6 hours to finish by hand methods are now finished in from 30 seconds to 10 minutes in a Liquamatte Wet Blasting Machine. It produces finishes mechanically at high speeds that previously have been impossible to achieve except by hand methods.

For example, at the Oling Tool Company a Liquamatte is saving an average of 50% on former time and labor requirements for surfacing tools prior to plating. On some items, such as drill bits, savings as high as 80% have been effected.

these bulletins tell how

send for these bulletins today

Save Time on Tools, Dies, Molds. Bulletin 43

Save Time on Glass Molds Bulletin 53

Save Time on Plastic Molds. Bulletin 63

American WHEELABRATOR & EQUIPMENT CORP. LIQUAMATTE WET BLASTING

852 S. BYRKIT ST., MISHAWAKA, INDIANA

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

by

Jerome H. Stanek,
Vice-President
STANEK TOOL AND MFG. CO.
Milwaukee, Wisconsin

I have been asked, as a representative jobbing tool and die manufacturer, to talk to you about **JOB SHOP METHODS OF BUILDING DIE CASTING DIES.** But before going into detail, let us briefly discuss the origin of the tool and die industry not too many years ago.

The jobbing tool and die shop came into being with the introduction of methods for high production of goods for mass markets. At that time a need became apparent for a service to build special tools at irregular intervals when new products were to be manufactured.

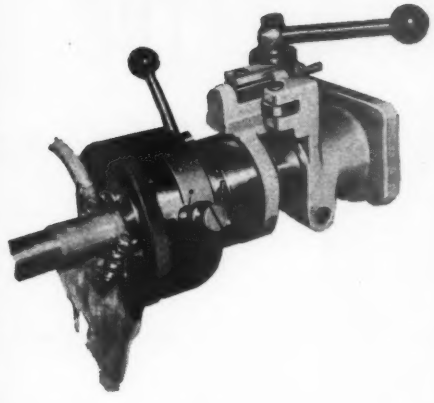
Ambitious, energetic, rugged individualists with mechanical skills recognized the demand and hung out their shingles offering that service to manufacturers in the industrial community.

From that humble beginning have emerged the fine tool and die shops now serving you in the die casting industry. These shops have developed just as your companies have grown. Skilled mechanics and practical

. . . *Continued on page 24*

From a talk before the Midwestern Group of the American Die Casting Institute, Inc., at Hotel Bismarck, Chicago, Ill., on January 13, 1953.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD



HOLDERS
for Jones & Lamson Die Heads

The best of Die Heads deserves the best of holders. With these holders, the extreme accuracy of your J&L Die Heads is reflected in the quality of the threads they produce. Holders for J&L Die Heads are available for most makes of turret lathes. Mail this coupon for a copy of the new illustrated catalog.

LEVER OPERATED DIE & TOOL HOLDERS
for more sensitive control. Eliminate side trimming. Hold reamers, taps and small drills.

FLANGE TYPE HOLDERS
ideal for threading long work that must pass through the face of the turret.

AXIAL FLOAT HOLDERS
for smooth, shock-free starting, better finish threads.

Jones & Lamson Machine Company
519 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.

Please send Catalog No. 504 "Holders for J & L Die Heads".

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ STATE _____

P.S. *Write for Catalog!* →

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
519 Clinton St., Springfield, Vermont, U. S. A.

COMPARATOR DIV.
Dept. 710

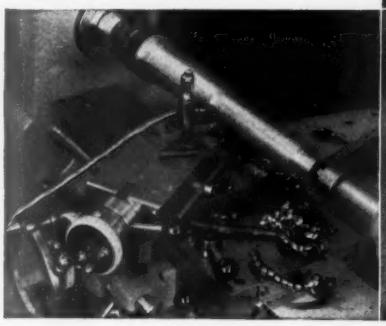
HARDINGE
ELMIRA, N.Y.

TOOL ROOM LATHE

Features QUICK Feed Change

Simply TURN KNOB FOR EXACT FEED REQUIRED

CHANGE FEEDS WITHOUT STOPPING SPINDLE OR CHANGING OR SHIFTING GEARS

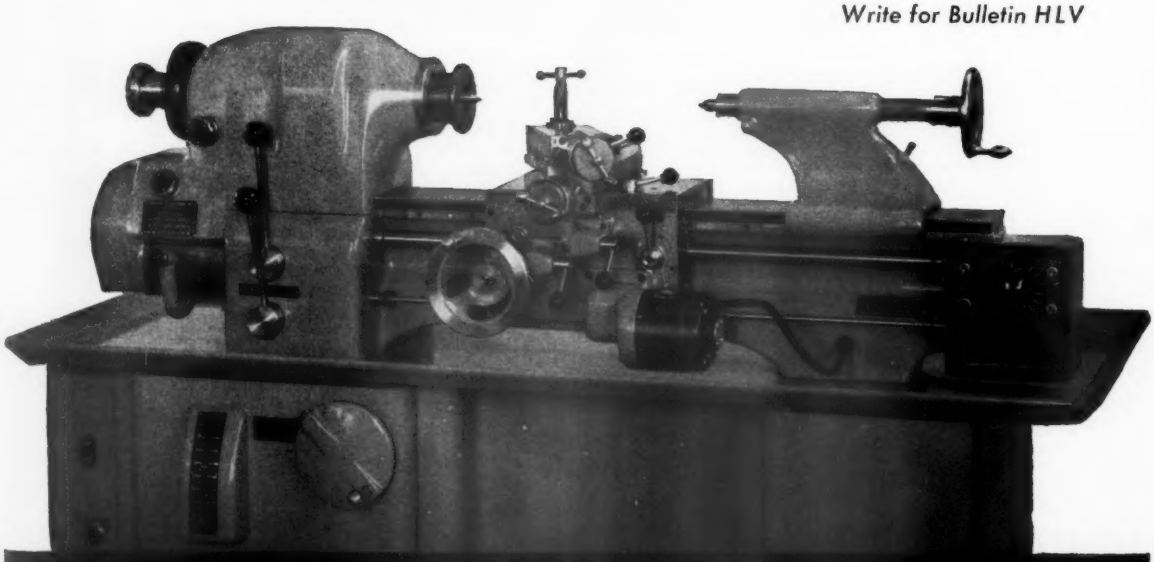


COARSE FEED

MEDIUM FEED

FINE FEED

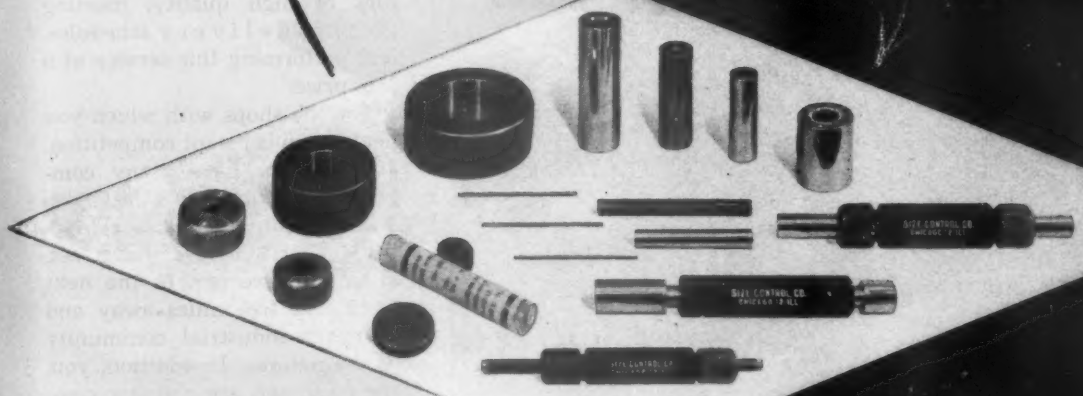
Write for Bulletin HLV



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Precision finishing with a Precision Abrasive



At the Size Control Company . . . Chicago, Illinois

Precision gage production
presents a difficult finishing problem.
A fine, long wearing finish must be achieved just
as the piece is brought to exact size—there is no excess
material left for refinishing if a scratch develops. Only the finest, most
reliable abrasives can be used. That's why, at Size Control Company, they . . .

Finish with Diamond . . . ELGIN Diamond!

ONLY ELGIN DIAMOND IN DYMO

is precision graded right in the Elgin laboratories

ORDINARY DIAMOND

ELGIN DIAMOND

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

Dept. D

How does YOUR PRESS check out?

STANDARD PRESS FEATURES (at no extra cost)	PRESS-RITE	YOUR PRESS
Uni-Cast Frame	✓	
Anti-Friction Roller Bearings in Flywheel	✓	
Four Point Engagement Sliding Clutch Key	✓	
Automatic Cam Operated Brake	✓	
Cam Operated Single Stroke Safety Mechanism	✓	
Built-In Tie Rods	✓	
Triple Ramway Lubrication	✓	
Bronze Bushed Main Bearings	✓	
Replaceable Die Shank Bushing	✓	
Airflex Friction Clutch (optional at extra cost)	✓	

PRESS-RITE
OPEN BACK—INCLINABLE
POWER PRESSES

NO. 60—60 TONS
AIR CLUTCH EQUIPPED

NO. 85
85 TONS

Get all the facts

About Press-Rite Press features, together with specifications. A complete line of 8 models from 5 to 85 tons capacity.

NOW You Get All These Features in *One* Press . . . the Press-Rite Press. Buy Press-Rite Presses today and get increased production . . . longer die life . . . greater operator confidence . . . longer press life . . . and scores of other benefits. Press-Rite Presses help to cut your operating expense and eliminate costly down time. Find out more about Press-Rite Presses today.

Send for Bulletin P552.

Sales Service Machine Tool Co. SSMT

PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

2363 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA

. . . Month's Talk, from page 20

engineers have studied die casting equipment, methods and problems. They have talked with you and worked with you to help solve your problems—constantly being of service. As a result, the job shop has become an important supplier to the die caster. In fact, there is indication of a trend in your industry to depend more and more upon the jobbing tool and die shop for your new die casting dies. It indicates that the job shop has been successful in producing for you die casting dies of high quality, meeting promised delivery schedules, and performing this service at a fair price.

The job shops with which you deal are in constant competition. Just as you have many competitors seeking every order, so does the job shop have competition — it's across the street, around the corner, in the next block, it's five miles away and in every industrial community of the nation. In addition, you, the customer, are a major competitor. You must operate a maintenance toolroom which, at the same time, is well equipped to build and does build many new dies.

All this competition, however, is good. It's good for you and good for the job shop. It demands that the job shop be constantly alert to new design ideas, new materials, new manufacturing methods and new equipment. The job shop must continue to produce a quality tool, on scheduled delivery at a fair price. It is a constant challenge which the progressive tool and die shop will meet.

When you seek the services of a job shop, you will find that it can perform its first service for you in design of the die casting die. Certain pre-requisites are necessary. The designer must become familiar with your die casting machines, your methods of injection, ejection,

. . . Continued on page 28

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

High speed aircraft propeller on test stand—built from tools "spotted in" in a DANLY SPECIAL DIE SET.

DANLY SPECIAL DIE SET, 46 by 140 inches, used for both production and checking of aircraft propeller tools.

DANLY SPECIAL DIE SETS

Final checking of a brazing fixture after "spotting in" to the master. A bridge gage is used with a series of templates as shown.

DEPENDABLE FOR ACCURACY

Here's proof . . . this Danly Special Die Set is used by one of the country's leading aircraft propeller manufacturers for "spotting in" all contour tools for a complete production line. Accuracy is a must because the tools, masters for duplicating planers and profilers as well as holding fixtures, must mate closely with the master pattern and with each other in the sequence of operations.

Dependable accuracy makes Danly Special Die Sets ideal for applications of this kind . . . and rugged construction makes them last longer, too, on any job. That's why leading diemakers everywhere prefer Danly Die Sets!

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

*CHICAGO	50	2100 South Laramie Avenue
*CLEVELAND	14	1550 East 33rd Street
*DAYTON	7	3196 Delphos Avenue
*DETROIT	16	1549 Temple Avenue
*GRAND RAPIDS		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
*LONG ISLAND CITY	1	47-28 37th Street
*LOS ANGELES	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
*PHILADELPHIA	40	511 W. Courtland Street
*ROCHESTER	6	33 Rutter Street

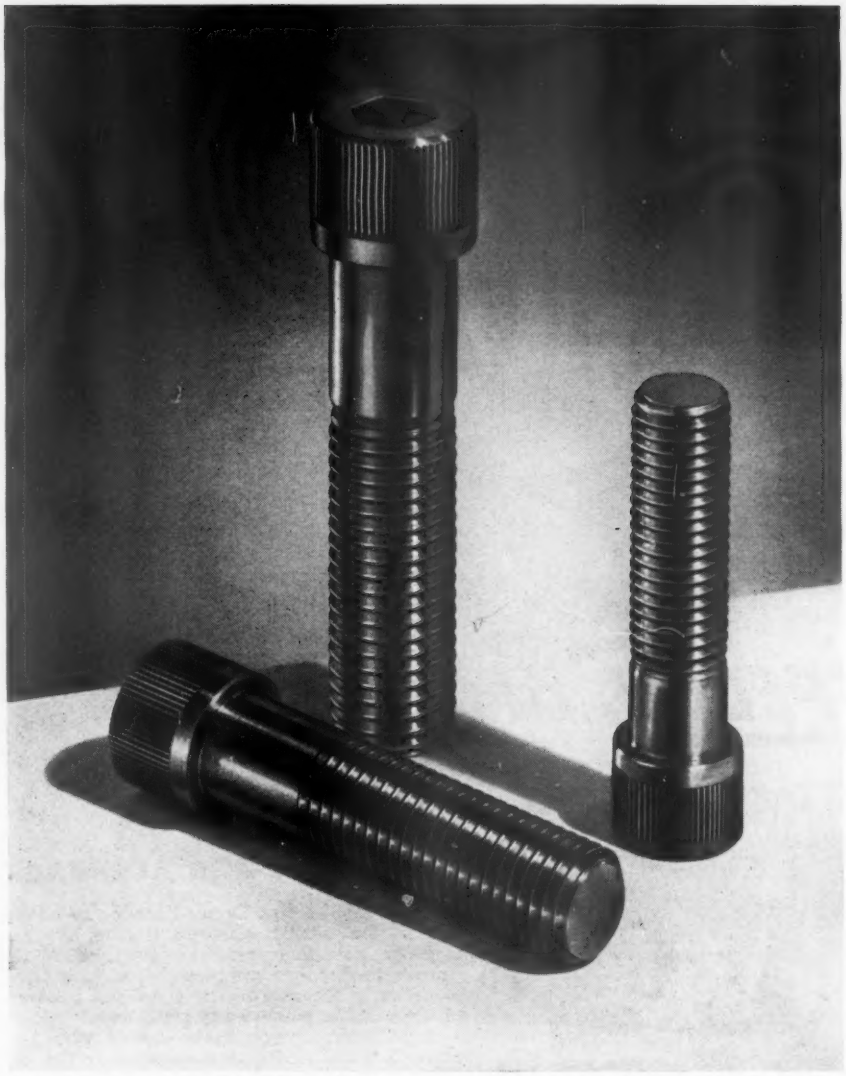
*Indicates complete stock

DANLY

DIE SETS AND DIEMAKERS SUPPLIES

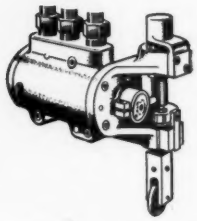
Our Fiftieth Year

A START FOR THE FUTURE

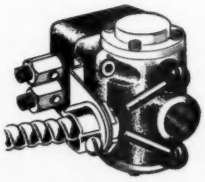


UNBRAKO SOCKET CAP SCREWS have knurled heads for sure grip, fast assembly; accurate hex sockets for positive, internal wrenching; fully formed threads, Class 3 fit.

Made of heat treated alloy steel, with controlled fillet and continuous grain flow, for strength; available in standard sizes from #4 to 1" in a full range of lengths.



USE UNBRAKO SOCKET CAP SCREWS for compact designs to save space, weight and material on machine tools and metalworking equipment.

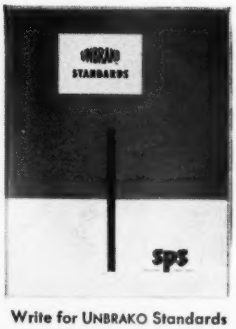


On electrical and electronic devices, textile machinery and automotive equipment.

On precision instruments, dies, jigs and fixtures, and many other applications too numerous to mention.

Do you really need a special UNBRAKO screw?

Before you specify a special socket screw, check UNBRAKO Standards. A standard UNBRAKO will do the job as well in most cases—and much cheaper. You'll get better service and faster deliveries, because UNBRAKO socket screw products are stocked by your industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 36, Pa.



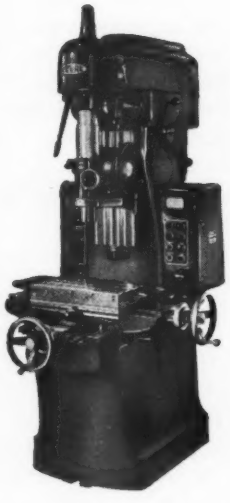
Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

sps JENKINTOWN PENNSYLVANIA

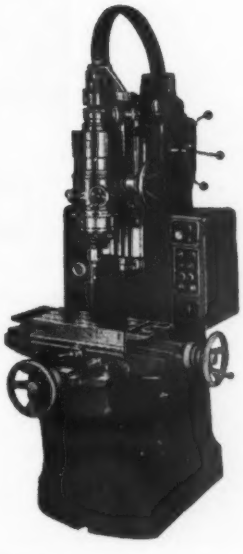
FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

NOW IS THE TIME TO PLAN AHEAD

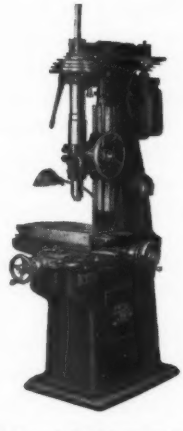


No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

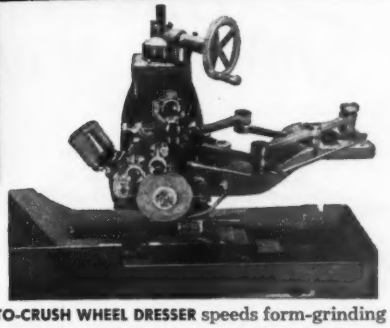
No. 2 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from 1/64" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.



No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
726 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

For better grinding it's well worth having!

SIMONDS ABRASIVE CO.

Grinding Wheels

It's Simonds Abrasive Company bulletin ESA 191 "Cylindrical Grinding Wheels" with recommended specifications—plus facts about feeds, speeds and wheel sizes. It's part of a *complete* library on Simonds products including wheels for rough grinding, finishing, cutting off, sharpening . . . abrasive polishing grain . . . mounted wheels and points . . . surfacing segments . . . everything *you* need for productive, economical grinding, factually described and supplemented with helpful hints. Write for ESA 191 . . . or for information on Simonds wheels for other grinding jobs. We'll also send name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

. . . Month's Talk, from page 24

pulling cores, slide design, runners and gating and general die construction. After this information is obtained, a die layout will be made and submitted to you for approval. Thereafter it is a matter of detailing and then die construction.

In designing a die the job shop will use standard die parts and accessories wherever practical and consistent with your standards. The following items are available as standard die casting die parts:

1. Mold bases and plates.
2. Ejector pins and ejector plates.
3. Push back pins.
4. Racks and pinions.
5. Leader pins and bushings.
6. Ejector boxes.
7. Sprue bushings.

It is to your advantage to use these standard parts where possible because they can generally be obtained at lower cost than if made up specially, and furthermore most of these parts will come from stock, thus improving delivery time to you.

In addition to selecting the above standard parts, the designer will adhere to stock steel sizes to assure prompt receipt of materials for building. Forging odd size steel blocks necessarily adds time to delivery promises.

The designer will, with your permission, specify steels with which his own shop has had particular success. Aluminum die casting steels, although basically of the same analysis, have certain individual qualities which give slightly different results in machining, filing and hardening. Hardening being the principal problem, the toolmaker prefers to work with a steel which has proved to be most consistent in hardening.

When it comes to building a die casting die, the job shop must exercise every bit of skill, ingenuity and energy to produce

. . . Continued on page 35

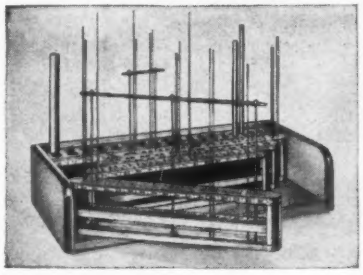
FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

inexpensive

. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

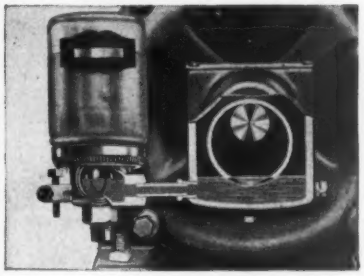


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

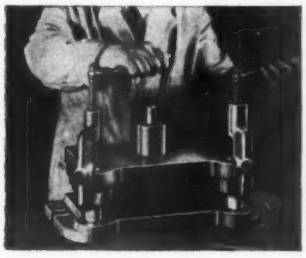
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

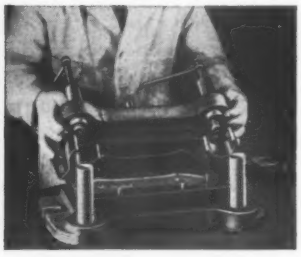
AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS





The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-52.

ACRO

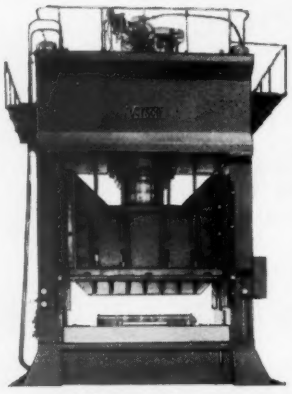
METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

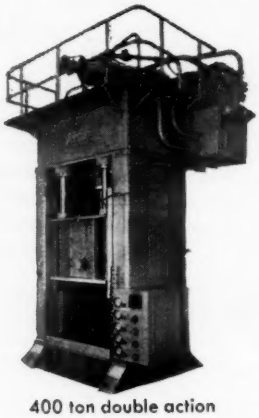
SEE ADVERTISERS INDEX, BACK OF BOO .. FOR INFORM-A-GRAM KEY NUMBERS

FROM TRADE Verson MARK
A COMPLETE RANGE OF HYDRAULIC PRESSES

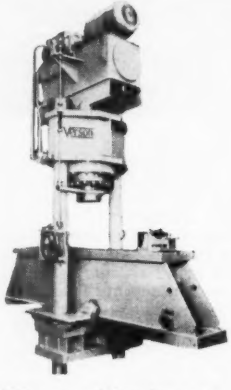


1200 ton straight side

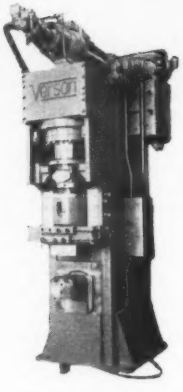
750 ton post type



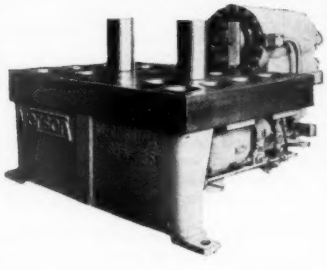
400 ton double action



400 ton straightening press



300 ton horn press



200 ton bending press

Write for your copy of the new Verson Hydraulic Press Catalog which contains detailed data on the entire Verson hydraulic line.

In the Verson line of hydraulic presses, there is a size and type to meet virtually every need from 75 tons up. In addition to the more common types illustrated above, Verson also manufactures such special models as gap type presses, bulldozers, hobbing presses, rubber pad cutting presses and pipe forming presses. If there is a question as to whether a mechanical type or a hydraulic type is best for your job, Verson, as a leading manufacturer of both types, is able to make unbiased recommendations.

Whatever your press problem, bring it to Verson and take advantage of our extensive know-how and experience.

A Verson Press for every job from 60 tons up.

TRADE Verson MARK

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

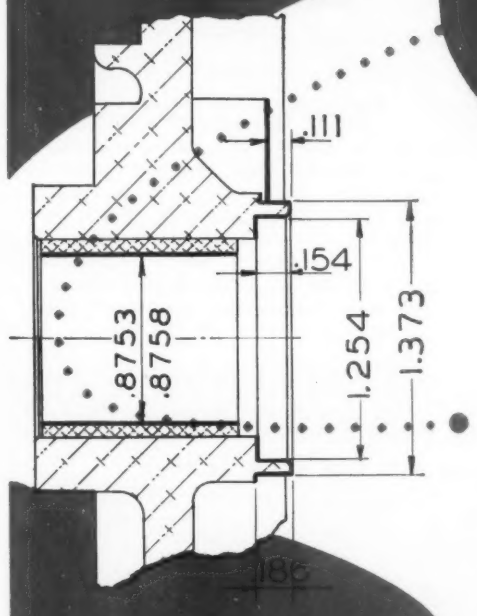
9335 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

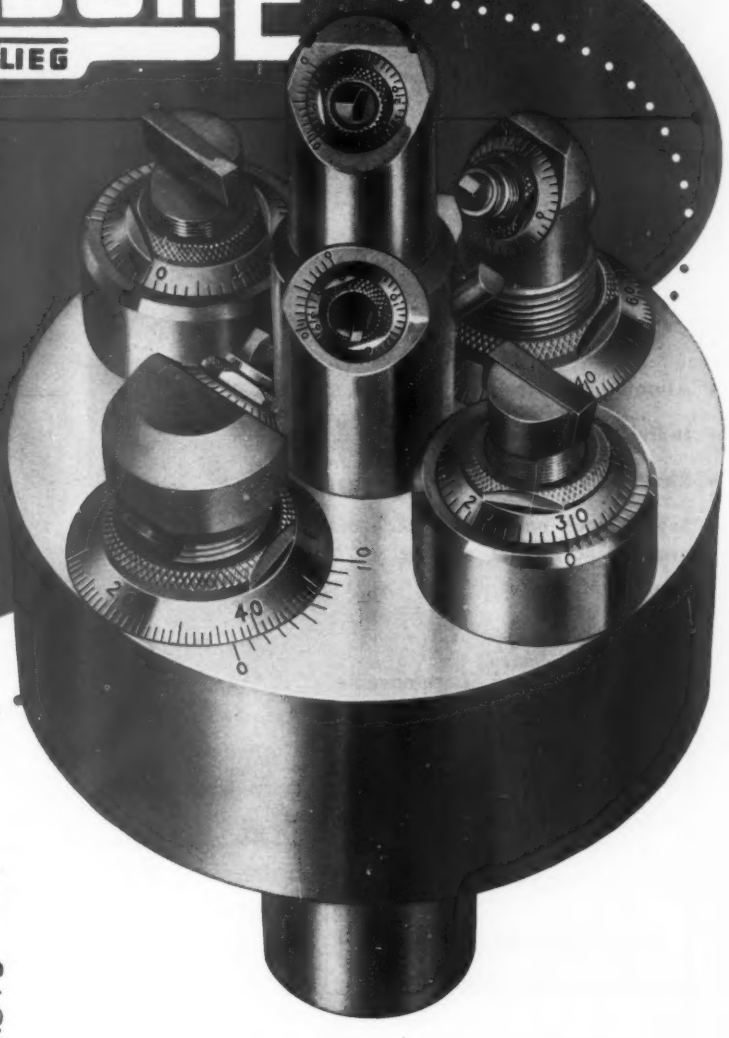
MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

MICROBORE
by DEVLIEG

. . . THE
Multi-purpose single point adjustable tool
for
PRODUCTION BORING, TURNING and FACING OPERATIONS.





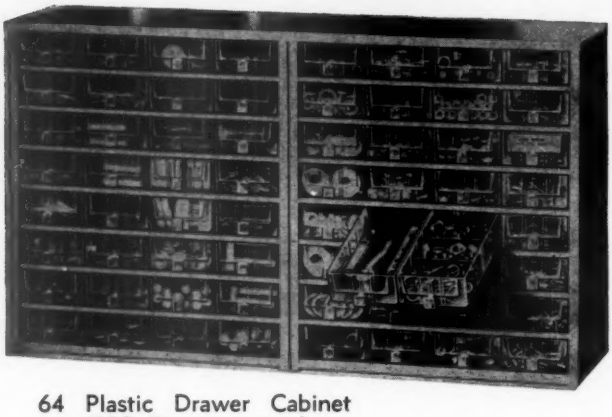
● Illustration shows typical example of cluster tooling using standard Microbore units for machining eight surfaces in a magneto plate at one pass. Each tool is independently adjusted by proven micrometer vernier principle and precise limits of accuracy are maintained on production runs.

DEVLIEG MICROBORE COMPANY
480 Fair Avenue • Ferndale 20, Michigan, U.S.A.

NOW

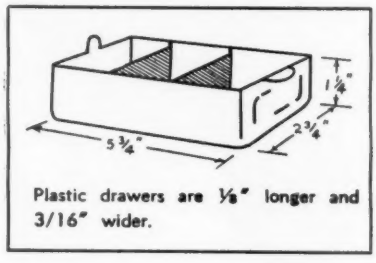
JIFFY CABINETS WITH METAL OR PLASTIC DRAWERS

- 7 useful cabinet sizes
- Aluminum or see-thru plastic drawers
- Individual drawer guides
- Removable drawer-dividers
- Safety catch on back of each drawer to prevent accidental spilling of contents



64 Plastic Drawer Cabinet
(192 Compartments)

Index label and 2 removable drawer dividers for each drawer.



Plastic drawers are ⅛" longer and 3/16" wider.

HANDIEST CABINET EVER BUILT FOR STORING SMALL ITEMS

No more frantic searching for misplaced items at home, shop, office or factory! EVERYBODY needs this convenient storage cabinet where small parts and supplies can be kept indexed, orderly, clean and easy-to-find. Your Jiffy Cabinet holds bolts, nuts, nails, screws, washers, drills, tools, repair parts, carbide tips, labels, radio parts, film . . . plus hundreds of other small, easily misplaced items! Attractive baked-on, silver-gray hammer-finish steel frame with rubber feet that won't mar any surface.

CLIP AND MAIL TO: HANDY PRODUCTS, P. O. BOX 2447, CLEVELAND 12, OHIO

PLEASE SEND IMMEDIATELY THE QUANTITY AND SIZE JIFFY UNIT LISTED BELOW

PLASTIC Drawer Cabinets ☐ 64 Drw. @$24.95* ☐ 48 Drw. @$20.95* ☐ 32 Drw. @$12.95* ☐ 24 Drw. @$10.95* ☐ 16 Drw. @$7.75* ☐ 12 Drw. @$5.95* ☐ 8 Drw. @$4.25*

METAL Drawer Cabinets ☐ 64 Drw. @$24.95* ☐ 48 Drw. @$19.95* ☐ 32 Drw. @$12.95* ☐ 24 Drw. @$9.95* ☐ 16 Drw. @$7.95* ☐ 12 Drw. @6.95* ☐ 8 Drw. @$4.95*

WE PAY ALL SHIPPING COSTS

NAME .....
STREET .....
CITY ..... ZONE ..... STATE .....
ORDERED BY ..... DEPT. .....

☐ Open Account, Purchase Order Enclosed.
☐ Check or Money Order Enclosed.
No. C.O.D.'s, Please.
*Ohio Customers Add 3% Sales Tax.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Correct MISALIGNMENT with the ERICKSON FULL FLOATING HOLDER

MODEL 189
COLLET TYPE
(illustrated)
gives both
PARALLEL ADJUSTMENT
and ANGULAR ADJUSTMENT

*W*ith the Full Floating Holder, another of the Erickson family of Precision Holding Tools, work and cutting tools may be quickly and easily adjusted to offset machine errors.

This Precision Holder compensates for *both* parallel and angular misalignment with the work spindle through the use of mechanical principles never before utilized in any floating holder.

Designed for floating reamers, taps, die-heads and all other chuck-held cutting tools, the versatile Erickson Full Floating Holder will help you increase production, reduce scrap, and lower tooling costs. A-6004

Available in Taper, Bushing and Erickson Collet Types

Write for Catalog Today

Catalog A: *Precision Collet Chucks*

Catalog B: *Adjustable and Full Floating Holders*

Catalog C: *Precision Tap Chucks*

Catalog D: *Speed Chucks and Air Operated Cylinders*

Catalog E: *Precision Expanding Mandrels*

Catalog F: *Speed Indexers*

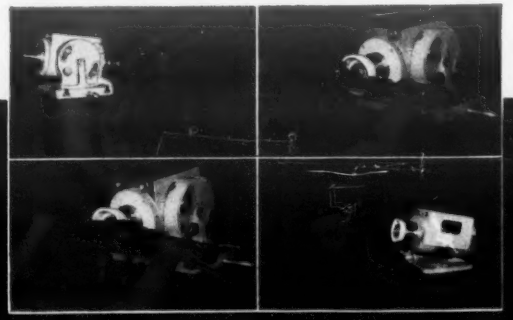
Catalog G: *Boring and Reaming Tools*

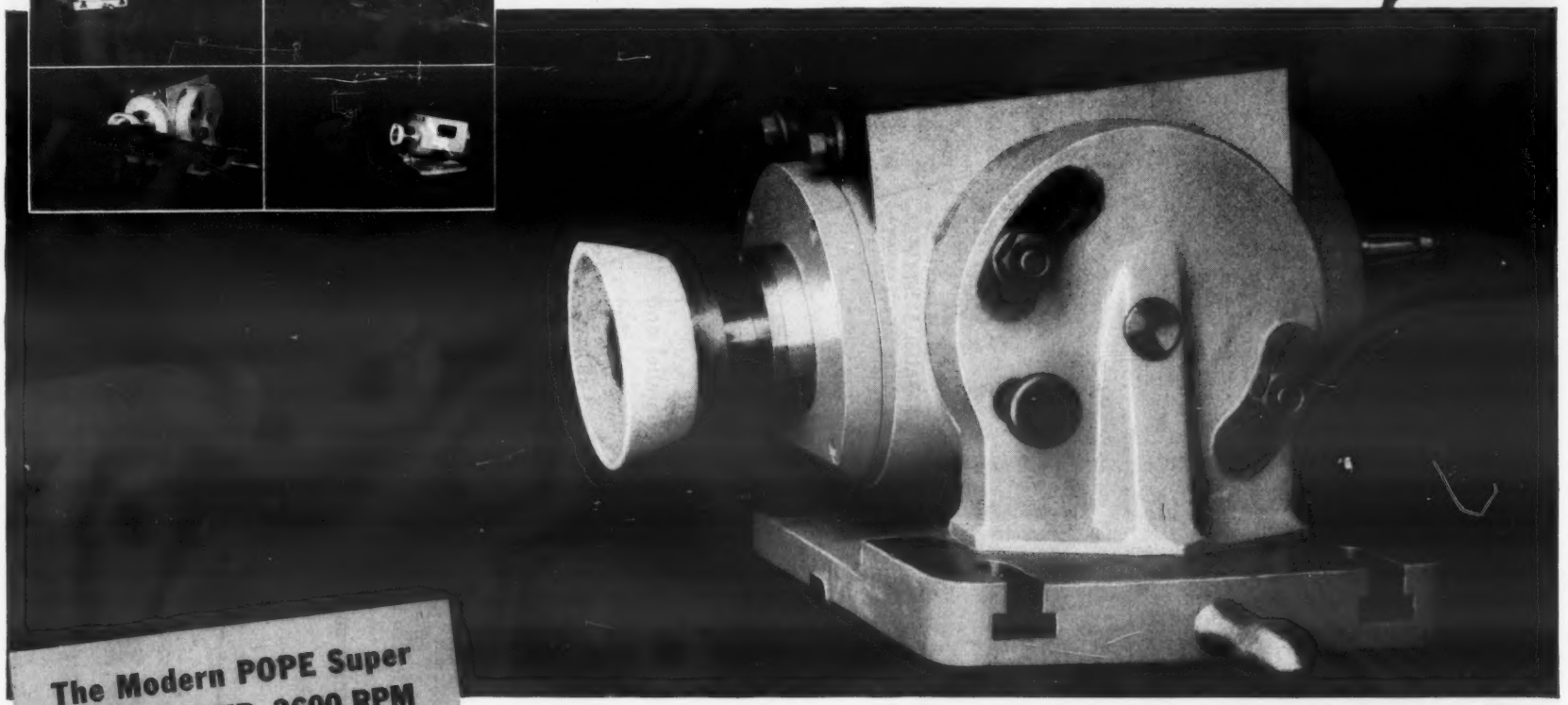
ERICKSON TOOL CO.

2314N HAMILTON AVENUE **CLEVELAND 14, OHIO**

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

The TOOL GRINDER For *You!*





The Modern POPE Super Precision 1 HP, 3600 RPM Motorized Tool and Cutter Grinder Head With

Angular Adjustment

In A Vertical Plane

This new unit is super-precision throughout... It is designed particularly for replacement of tool grinder heads which do not have the extremely useful angular adjustment in a vertical plane.

It will more than pay for itself — reduces set-up time — makes wheels cut faster — spark out quicker — produces the kind of cutting edge on your tools that stands up and cuts longer.

Pope Motorized Grinder Heads are available for most makes of cutter and tool grinders. Ask for quotation to cover *your* grinder.

No. 92

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION

251 RIVER STREET • HAVERHILL, MASSACHUSETTS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Month's Talk, from page 28

that die for the quoted price. Every die casting die is separate and distinct and the only source of revenue for the owners.

Job shops employ highly skilled tool and die makers and toolroom machinists. They work under constant pressure to produce a quality tool, on time and within the quoted price.

To facilitate rapid production, it is the general practice to design the die in complete detail before sending it into the shop. By doing so, it is possible to order all necessary material for the toolmaker and get it to him when needed. Further, a completely detailed drawing relieves the toolmaker of any need, for instance, to calculate shrinkage or to locate ejectors to avoid water lines. The responsibility of the toolmaker is to build the die as per print.

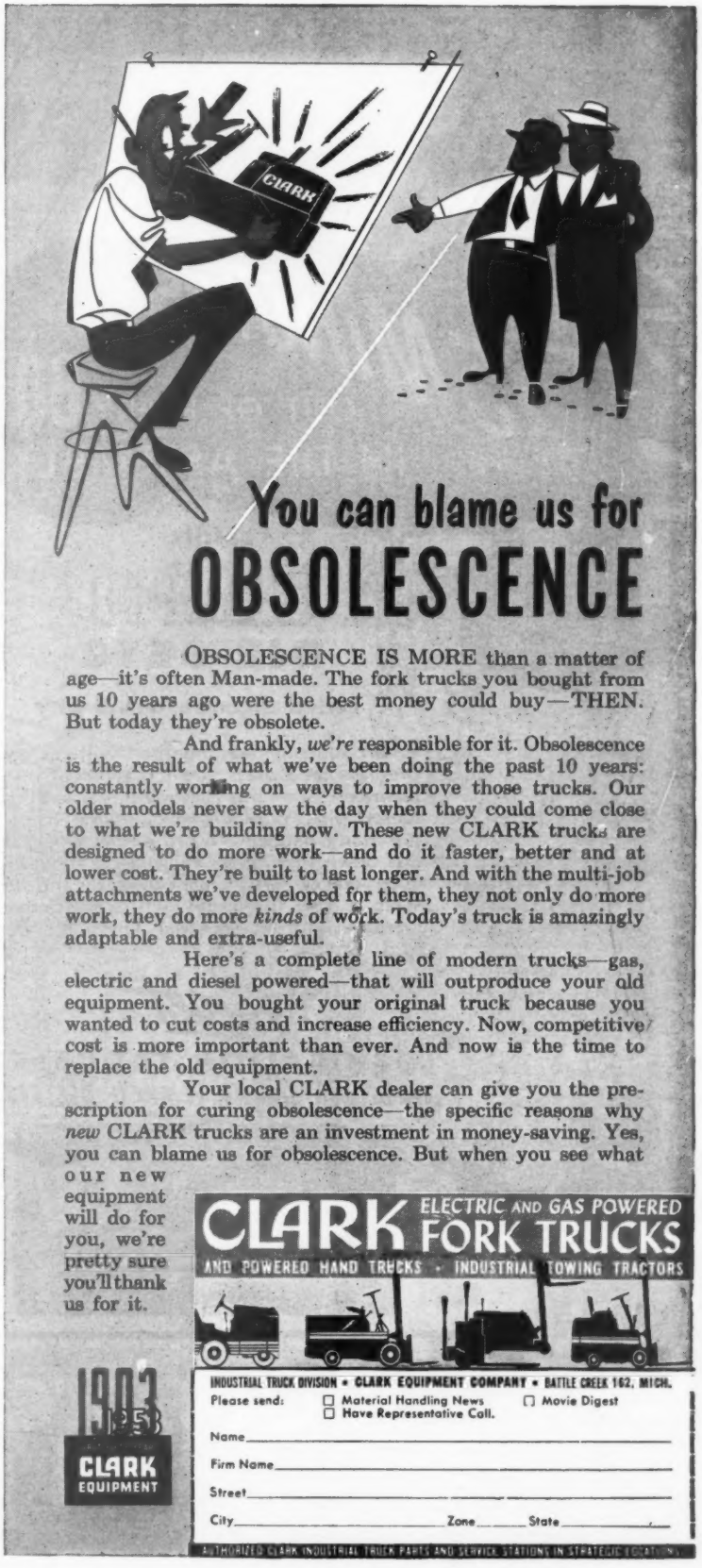
When the die is completely detailed, it is possible to have certain parts completed by a machine operator without detailed instructions from the toolmaker. The planer operator, lathe hand, jig borer, milling machine, die miller and grinding machine operators can all perform definite operations on a die with a minimum of direction from the toolmaker.

The toolmaker will perform some of the machining on the die, perhaps the filing and all fitting and assembly, and reassembly after hardening. He is principally responsible for the finished product.

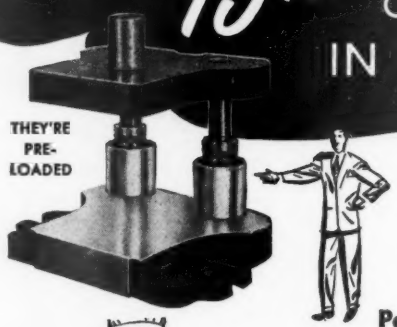
In addition to using specialists to hasten production of the die, a job shop constantly studies new equipment and methods which will enable it to produce a better tool, faster and at lower cost.

It was in 1939 that Kearney and Trecker first introduced its rotary head tool & die milling machine. That was only 14 years ago and today every die

. . . Continued on page 36


CLARK
You can blame us for
OBSOLESCENCE
OBSOLESCENCE IS MORE than a matter of age—it's often Man-made. The fork trucks you bought from us 10 years ago were the best money could buy—THEN. But today they're obsolete.
And frankly, we're responsible for it. Obsolescence is the result of what we've been doing the past 10 years: constantly working on ways to improve those trucks. Our older models never saw the day when they could come close to what we're building now. These new CLARK trucks are designed to do more work—and do it faster, better and at lower cost. They're built to last longer. And with the multi-job attachments we've developed for them, they not only do more work, they do more kinds of work. Today's truck is amazingly adaptable and extra-useful.
Here's a complete line of modern trucks—gas, electric and diesel powered—that will outproduce your old equipment. You bought your original truck because you wanted to cut costs and increase efficiency. Now, competitive cost is more important than ever. And now is the time to replace the old equipment.
Your local CLARK dealer can give you the prescription for curing obsolescence—the specific reasons why new CLARK trucks are an investment in money-saving. Yes, you can blame us for obsolescence. But when you see what our new equipment will do for you, we're pretty sure you'll thank us for it.
CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS
1903 1953
CLARK EQUIPMENT
INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 162, MICH.
Please send: ☐ Material Handling News ☐ Movie Digest ☐ Have Representative Call.
Name
Firm Name
Street
City Zone State
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Save 15 Minutes OUT OF EVERY 60 IN DIE ASSEMBLY



specify LEMPCO DIE SETS

Perfect alignment on every try

When you put dies mounted with Lempco Die Sets on a press you forget about maintenance. Such mishaps as frozen bushings, scored pins, pulled shanks or die damage just don't happen. More pieces per grind, less down time, close more accurately, produce pieces with cleaner edges and less scrap. For literature, write to Lempco Products, Inc. (Industrial Division), Bedford, O.

No pry bars, lead hammers or die pullers necessary!

Perfect alignment on every try

Forget LUBRICATION TROUBLES When you specify LEMPCO DIE SETS

LEMPCO

. . . Month's Talk, from page 35

casting die builder has at least one. Why? Because it enables him to produce a better die, faster and at lower cost.

Duplicating equipment of one kind or another is found in every job shop. You will see Kellers, or Gortons, or attachments such as the Turchan unit. If the shop does not have a Keller, you know that it has a source of Kellering when your die requires it.

Heavier milling machines, lathes and boring equipment are at your service in the job shop.

Carbide cutting tools are regularly used. With modern carbide face mills and heavy 15 HP milling machines you will see 5% chrome steel being machined at 400 to 500 surface feet per minute. But it's not magic. The job shops are progressive. $450.00 will be spent for a 12-inch carbide face mill with 12 teeth and it will be mounted on a $20,000 machine. That cutter will remove ¼ inch of stock on a 5% chrome block, eight inches thick, at a feed rate of 13½ inches per minute.

Yesterday I watched a 3-inch carbide cutter facing a 1-inch mild steel plate. The cutter was revolving so fast that it sounded like a buzz saw as it hogged the steel away with a 30-inch feed.

Job shops are using carbide cutters with inserted blades, hence the cutter body need not be removed from the machine for sharpening. It is only necessary to index each blade 90 degrees in the body or insert another set of reground blades which have been ground in a fixture. There is a minimum of machine down time and little delay on your job.

With modern carbide face milling equipment, it is essential that you have ample horsepower to pull the cutter. A stalled spindle ruins a complete set of blades.

We are now confronted with the problem of providing an

. . . Continued on page 38

Lighter . . . faster Rotor grinders

"PAID OFF" in 48 days

JOB: Grinding welds on truck cabs. Using slow, 20-pound electric grinders. Only 2800 r.p.m. under load.

SOLUTION: Rotor Application Engineer suggested changing to Rotor 6" Air Grinders that weigh only 9¾ pounds. Speed 5300 r.p.m. under load.

RESULTS: Stepped up metal removal, increased wheel life. Lower maintenance. Cut man-hours per cab. Savings "paid off" cost of Rotor Grinders in 48 days—on basis of 50% use factor.

Call in your Rotor Application Engineer for a study of your portable tool operations to suggest improvements. Write for Catalog No. 38.

AIR O'TOOL

ROTOR GRINDER FACTS

LIGHTER . . . Unique two-blade design and magnesium handles. Easy to move around. 6" Rotor Grinder weighs only 9¾ lbs. . . . 8" only 11¼ lbs.

FASTER . . . Rotor Grinders, known as the "Power Plus" line are recognized everywhere for their high speed *under load.*

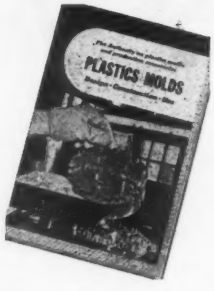
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

"KNOW-HOW" FOR SALE

PLASTICS MOLDS

by Gordon B. Thayer

Tells how to
ESTIMATE • DESIGN
BUILD • USE
PLASTICS MOLDS



22 chapters (272 pages) of plastics tooling and production KNOW-HOW. More than 200 illustrations, tables and charts. *$3.49 per copy.*

DIE ESTIMATING

Fourth Edition

62 pages of shop-proved data, 26 time value tables, 27 scale drawings; thoroughly practical and easily-understood text. DIE ESTIMATING provides the KNOW-HOW and SHOW-HOW for determining what it takes in units of time to build a die.

$3.00 per copy.

KNOW-HOW LIBRARY SERIES

PRACTICAL QUALITY CONTROL

Timely, instructive and written in the KNOW-HOW, TELL-HOW manner, this 36 page collection of articles and case-histories by top-flight authorities takes the study of Quality Control out of the "armchair textbook" category.

$1.00 per copy.

COLD FORMING of the STAINLESS STEELS

by Lester F. Spencer

28 pages of KNOW-HOW on the blanking, punching, perforating, and bending, forming, deep drawing and spinning of the stainless steels.

$1.00 per copy.

ACCURACY & the GEOMETRY of PRECISION

by E. Willard Pennington

A historical and detailed, step-by-step presentation of the methods of generating by scraping, master surface plates, straight edges and 30°, 45°, 60° and 90° angles. *35c per copy.*

HUEBNER PUBLICATIONS, INC., 1975 Lee Road, Cleveland 18, O.

Gentlemen: Please send me at once:

———Plastics Molds .....$3.49* each
———Die Estimating .....$3.00* each
———Cold Forming of the Stainless Steels .....$1.00* each
———Accuracy and the Geometry of Precision .....35c* each
———Practical Quality Control ..$1.00* each

NAME .....
COMPANY .....
STREET .....
CITY ..... ZONE ..... STATE .....

Open account shipments on company purchase orders. Otherwise, check with order, please. No C.O.D.'s, please. *Ohio customers add 3% sales tax.

. . . Month's Talk, from page 36

easier method of clamping plates and blocks to a milling machine table. Feeds have been stepped up so high that all the "snap" has been removed from the job. Now it is almost all tightening and loosening studs and nuts and—let me tell you—it's not easy work.

High speed steel end mills are the main cutting medium in building die casting dies. The job shop may purchase special three-flute cutters for roughing. These cutters are stronger and faster cutting than the conventional two-flute type. Solid carbide end mills are used with care for the salvage and reworking of hardened die sections.

Many of you make castings with thin ribs or fins. Most any job shop will build your mold with ribs cut into the solid with end mills. These cutters may be as small as 3/32-inch diameter at the small end, tapering 1½-degrees on a side and cut a slot 1 inch deep. In shallow slots shorter cutters can be used with smaller diameters and with tapers as little as ½ degree per side.

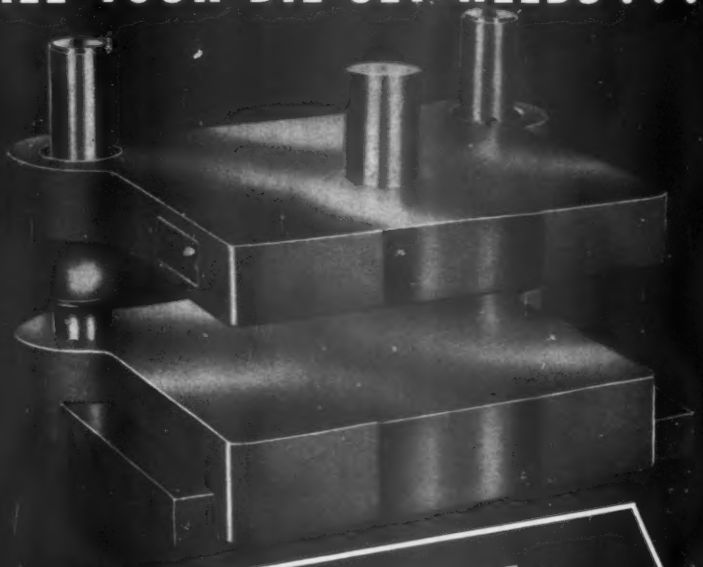
A job shop will stock files of every conceivable shape and cut. Odd shapes are often necessary to reach remote areas in the cavity. Stones are used before and after hardening, and in some cases, where zinc castings are to be chrome plated, the cavity may be highly polished with diamond compound.

Job shops are constantly alert for new methods which will enable them to build you a die to produce a casting which yesterday was impossible to produce economically. We always listen to the fellow who has a new or better way.

You can remember, not so long ago, how we hammered out heads of ejector pins, and what trouble you had with broken pins. Someone studied the subject and made a special unit to upset heads on ejector

. . . Continued on page 40

FOR ALL YOUR DIE SET NEEDS . . .



SPECIFY SUPERIOR DIE SETS

For Fast Local Service Call these Expert Superior Representatives

- Kalamazoo, Mich.—Phone 7988
- Indianapolis, Ind.—RHoadway 5668
- Chicago, Ill.—CEntral 6-3869
- Dallas, Tex.—Riverside 8138
- Syracuse, N. Y.—3013 James St.
- Rockford, Ill.—Phone 3-3991
- St. Louis, Mo.—Lucas 1223
- Milwaukee—Mitchell 5-6027
- Dayton, Ohio—Hemlock 6209
- Atlanta, Ga.—ATwood 7771
- Detroit, Mich.—Lincoln 1-3836

Precision Workmanship, Wide Range of Die Set Sizes, Safer, Easier to Handle

Superior precision workmanship, wide range of die sets and exclusive *Safety Flanges, Lock Jaw Lifting Device* and *E. Z. Lift Sling Chain* speed die production from bench to press and eliminate needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers, ruin costly dies in process or completed, or even damage press equipment.

Superior engineers will help determine your needs and can show you how Superior Die Sets have eliminated these handling dangers.

Write for *free* descriptive catalog No. B-100—that gives you complete details on how you can cut your Die making costs and speed handling.

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

SIX SPINDLE
PRE-SELECTIVE SPINDLE SPEEDS
TURRET TYPE AUTOMATIC INDEXING
DRILLING AND TAPPING MACHINE
. . gives you 6 MACHINES IN ONE

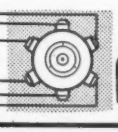
THE NEW No. 2 MODEL A
Burgmaster

Designed for . . .
HIGHER PRODUCTION WITH GREATER ACCURACY AT LOWER COST PER PIECE MACHINED

The No. 2 Model A BURGMASTER will definitely cut your second operation costs because: Loss of time due to movements of parts from one spindle to another are eliminated; Close tolerances on size and concentricity are easily maintained; Set-up is simple and fast—unskilled operators can run the machine; Less floor space and power required; Rigidity, power and spindle speeds permit the use of high cutting speeds.

Now equipped with Warner electric clutch units in speed change mechanism.

★ ¾" Drill Capacity
★ ½" Tap Capacity
★ 1 to 2 H.P., 2 speed, 3 phase, 60 cycle Motor
★ 12 Spindle Speeds, ranging from 225-3000 R.P.M
★ 4 Speeds, pre-selective per spindle, at any one setting
★ 8" Ram Feed
★ 19" Table Travel
★ Throat Depth—11-5/16"
★ Spindles Mounted on Class "O" Timken Bearings
★ Power Index, utilizing Geneva Mechanism
★ Individual Depth Stops
★ Completely Enclosed Gear Box
★ Table work surface—17"x33"
★ Approximate weight—1650 lbs.
★ Floor space required—36"x48"
★ Extremely close tolerance can be held



Write today for detailed information.

BURG TOOL MANUFACTURING CO. DEPT. TP-4
3743 DURANGO AVENUE • LOS ANGELES 34, CALIFORNIA

HERE'S Tool-flex
NEOPRENE MOUNTED FLOATING TOOL HOLDERS
Another Outstanding Product of
BURG TOOL MANUFACTURING CO.

SELF-CENTERING
(ELIMINATES COSTLY SET-UP)
FULL-FLOATING • POSITIVE DRIVE
OIL-RESISTANT NEOPRENE MOUNTING
REDUCES TOOL BREAKAGE
SIMPLE CONSTRUCTION
(ONLY FOUR MAIN PARTS)

Write for information . . . Dealer inquiries invited

BURG TOOL MANUFACTURING CO. Dept. TP-4
3743 DURANGO AVE. • LOS ANGELES 34, CALIF.

. . . Month's Talk, from page 38

pins. They are excellent. Now every job shop will prefer to purchase and install these stock ejector pins.

The use of hobbing is limited in aluminum die casting dies because the 5% chrome steel is so tough. Some engravers have developed a method of sinking cavities by a combination of hobbing and acid etching. It can be readily done in 5% chrome steel and is far superior to a duplicated cavity. The job shop will utilize the services of these engravers to give you a better product.

A new method of sinking small cavities into hardened materials with only a soft master has recently been publicized. You may have read about it—it has been named Cavitron. Ultra high frequency vibrations of low amplitude with boron carbide as an abrasive compound are used. Although this process may have limited application, you will find that the job shops will study and apply this new manufacturing technique where it is found to give you a better product at lower cost.

The job shop will seldom possess machinery which is used infrequently. Shop space is too valuable to be occupied by non-productive equipment, and furthermore a better use can always be found for capital funds. Therefore, job shops will utilize the services of those who specialize in particular phases of mold building.

A local specialist may offer to perform surface grinding on a large grinder. Another may have hobbing facilities. Engravers are often engaged to make cavities and punches of an artistic nature. Keller facilities are few and generally accommodate shops in a large area.

Welding a die cavity is avoided by all job shops. Occasionally, however, it must be done to salvage a core or cavity which would require many hours to

. . . Continued on page 72

Warplis

PRECISION GROUND

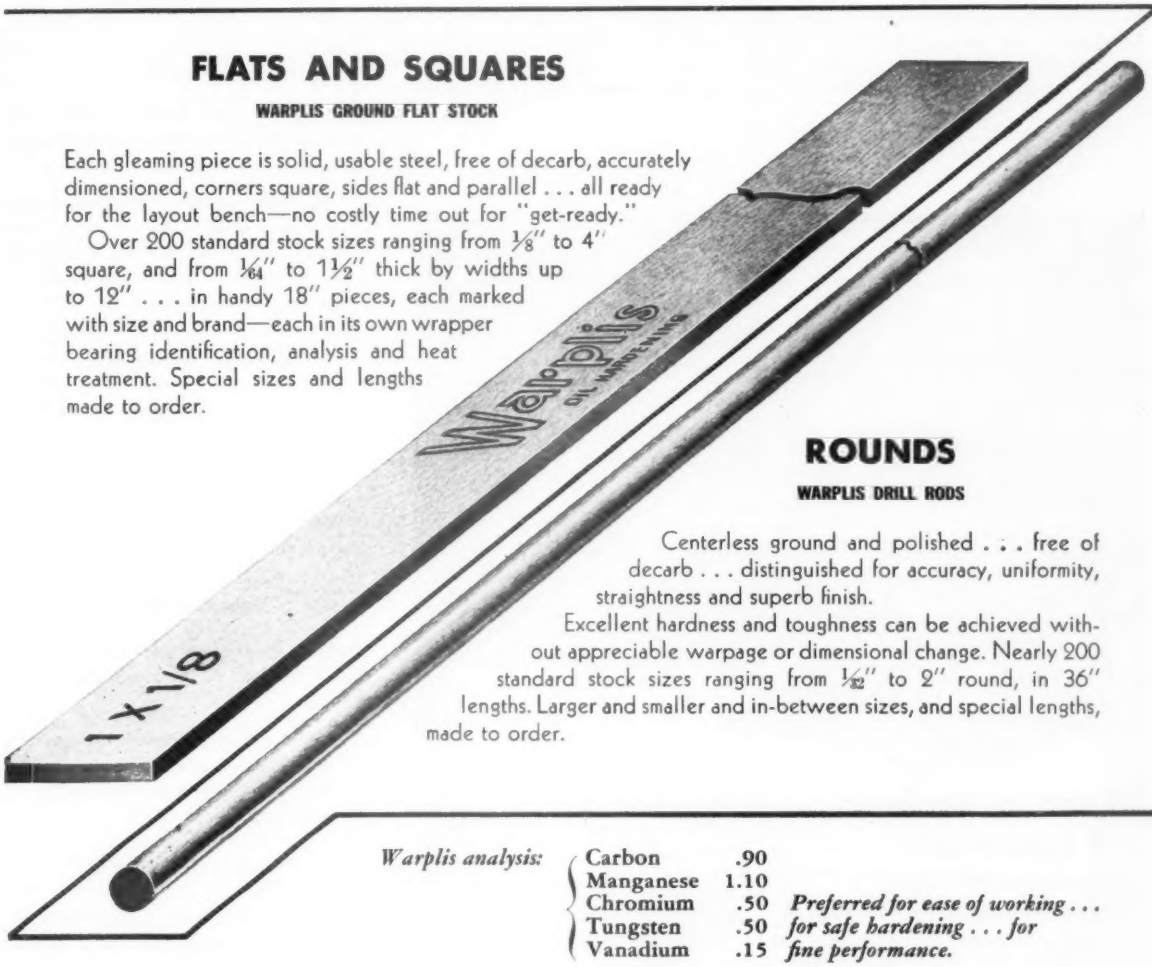
OIL HARDENING NON-WARPING TOOL STEEL

FLATS AND SQUARES

WARPLIS GROUND FLAT STOCK

Each gleaming piece is solid, usable steel, free of decarb, accurately dimensioned, corners square, sides flat and parallel . . . all ready for the layout bench—no costly time out for "get-ready."

Over 200 standard stock sizes ranging from ⅛" to 4" square, and from 1/64" to 1½" thick by widths up to 12" . . . in handy 18" pieces, each marked with size and brand—each in its own wrapper bearing identification, analysis and heat treatment. Special sizes and lengths made to order.



ROUNDS

WARPLIS DRILL RODS

Centerless ground and polished . . . free of decarb . . . distinguished for accuracy, uniformity, straightness and superb finish.

Excellent hardness and toughness can be achieved without appreciable warpage or dimensional change. Nearly 200 standard stock sizes ranging from 1/32" to 2" round, in 36" lengths. Larger and smaller and in-between sizes, and special lengths, made to order.

Warplis analysis:

Carbon	.90
Manganese	1.10
Chromium	.50
Tungsten	.50
Vanadium	.15

Preferred for ease of working . . . for safe hardening . . . for fine performance.

Procedures may be simplified . . . time and money saved . . . by standardizing on these companion products of Tiffany-like quality for all tool and die requirements. From fine steel distributors everywhere. Size and price folders, and Warplis Notes on Hardening pamphlet, on request.

Also *Monaca* and *Dukane* water hardening drill rods • *Reliance* water hardening flat and square drill rods
High Speed drill rods

PITTSBURGH TOOL STEEL WIRE CO.

Since 1902 . . . makers of cold finished fine steels in all sizes, grades and shapes

MONACA, PA.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Editorial Index

SOON TO APPEAR IN FUTURE ISSUES

Machining on the Single Spindle Automatic • Machine Tool Adaptations • Press Workability of Lurium • Do's and Don'ts for Press Brake Tools • Closer Dimensional Control of Turret Lathe Work • Production and Inspection Fixtures for Converter Parts • Blanking Die Designs and Applications •

Editorial: "Kanigen", a research program jackpot 45

Die Casting Dies

"Job Shop Methods of Building Die Casting Dies" by Jerome H. Stanek, Stanek Tool & Manufacturing Company 20

Mr. Stanek outlines the important part the jobbing tool and die shop plays in industry.

Weldments

"Weldments Click in Process Machines" by G. N. Bull, The Lincoln Electric Company 47

Mr. Bull points out that weldments are used extensively because they are economical, serve their purposes well, and are readily adaptable to machine construction.

Carbide Tipped Tools

"Machining the Aluminum Alloys With Carbide Tipped Tools" by Lester F. Spencer, Landers Frary & Clark 50

The main theme of this article is on the use of carbides as a tool material in machining aluminum alloys.

Grinding Wheels

"Wheel Preparation and Related Problems" by M. A. Bergson, The DoAll Company 54

Mr. Bergson discusses the various wheel preparation operations and their relationship to good results in surface grinding.

Grinding and Lapping

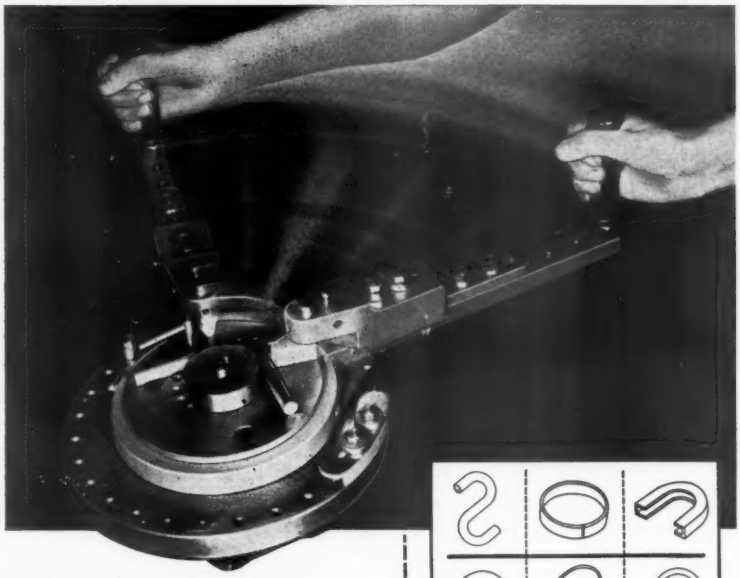
"Grinding and Lapping Stresses in Manganese Oil Hardening Tool Steel" by Dr. Harold R. Letner and Dr. Harold Jack Snyder, Mellon Institute of Industrial Research 56

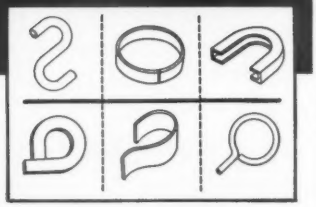
A report on an investigation of the stresses set up in tool steel when ground and lapped.

Foreman Training

"Management Training for Foremen" by M. K. Sheppard 58

It is the objective of the author's philosophy to make the foreman a businessman, as though he is in business for himself.





Bend a Variety of Materials

Accurately, Easily, Quickly with a versatile DI-ACRO* BENDER

Simple and complex bends can be formed and duplicated in many ductile materials with a versatile Di-Acro Bender. Bending capacity of the five hand operated models ranges from 1/16″ wire to 1″ round mild steel bar. Many accessories are available for bending various materials and shapes. The Di-Acro Bender can be delivered completely tooled for most forming requirements in solid materials and tubing.

WANT MORE INFORMATION?
Send for New 32-Page Catalog

Gives complete details on hand and power operated Di-Acro Benders, Brakes, Notchers, Punch Presses, Rod Parters, Rollers and Shears. Send for your copy today—there's no obligation.

DI-ACRO HYDRA-POWER BENDER

A universal hydraulically operated bending machine that is equally as flexible as hand operated machine. Di-Acro Hydra-Power Benders are especially designed for those long runs and heavy bending operations which are impractical for manually operated equipment.

*Pronounced Die-ack-ro.

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO. • 315 8th Avenue • Lake City, Minn.

Editorial Index

Machine Tools

"Machine Tools Adapted for Atomic Artillery" 70

Conversion of an old 19 ft. lathe to perform the preliminary boring on the Army's first "atomic" artillery piece is described.

Power Brushing

"Power Brushing Diamond Wheels Increases Cutting Action 80 percent"..76

A new method of using power brushing to increase the cutting action of diamond wheels.

Preventive Maintenance

"A Preventive Maintenance Program" by George J. Martin, National Biscuit Company 92

Details of the preventive maintenance program in effect at National Biscuit are given.

— shorts —

A New Single Spindle Automatic... 74
Automatic Factories and Mechanization 128
Small Business Summary 129
Blast Cleaning Eliminates Paint Peeling Problem 148
New Technique for Forming Intricate Die Cavities 158
Spray-On Dye Penetrant 160
Double ½ Vise 169
Micro-Height Gage 171

— departments —

"PUBLICATION PREVIEWS" 94
Capsule description of current literature. Bulletins, brochures, catalogs and circulars—you name it!

"MEN YOU SHOULD KNOW" ...110

"PROGRESS ON PARADE" 135
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

"QUICK PIC CATALOGS" 151
Look—a pictorial selection of today's newest literature. Reach up on the rack—take your pick.

"SHOP AIDS" 157
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

SOON TO APPEAR IN FUTURE ISSUES

Power Brushing as a Production Tool • Deep Drawing Rectangular Shapes • Ultrasonic Machining • Index Press Tooling • Grinding and Lapping Stresses in Tool Steel • Optical Microscopy for the Inspector • Automation • Quality Capability • Contact Stamping Operations •

EX-CELL-O Hydraulic Power Units
FOR SPECIAL PURPOSE MACHINES
EX-CELL-O
Ex-Cell-O Quill Type Hydraulic Power Units provide a compact, flexible source of power for feeding, rotating and retracting cutting tools. They are especially suitable for automatic drilling, reaming and counterboring, using a single tool held directly in the spindle, or using two or more tools in a multiple head. Three standard units are available—styles 28-A, 21 and 20, shown above. For full information send for Bulletin 45828.

Patent Pending

At last—a practical solution to eliminate the exacting layout process and tedious, expensive milling procedure required to mill fixture key slots. Now save over 50% of your laying out and milling costs and eliminate five out of seven operations. The Jergens Sine Fixture Keys are made with shank diameters of either 5/8" or 3/4". The keys which fit table slots of 1/2" to and including 7/8" have 5/8" diameter shanks. For table slots 15/16" to and including 1 1/8", the key shanks are 3/4" diameter. This simplifies design and construction because only two fixture key hole sizes are involved. It also results in a given fixture being usable on machine tables of several sizes and permits taking fullest advantage of idle machines.

PART NO	A	B	C
SFK 500	.625	.4995	1"
SFK 5625	.625	.562	1"
SFK 625	.625	.6245	1"
SFK 6875	.625	.687	1"
SFK 750	.625	.7495	1-1/8"
SFK 8125	.625	.812	1-1/8"
SFK 875	.625	.8745	1-1/8"
SFK 9375	.750	.937	1-3/8"
SFK 1000	.750	.9995	1-3/8"
SFK 1.062	.750	1.062	1-3/8"
SFK 1.125	.750	1.1245	1-3/8"

All Sine Fixture Keys are guaranteed as follows: Concentric within .0005—Tensile approx. 200,000 PSI—Material 4140—Heat treat 40-45 Rockwell.

Write today for Jergens' New Folder TP-4

Jergens TOOL SPECIALTY CO.
712 E. 163rd ST. • CLEVELAND 10, OHIO • KENMORE 2015

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

editorial

"Kanigen", a research program jackpot

One of the most interesting stories of the workings of industrial research to come our way in many a moon is that of "Kanigen", a new process of nickel plating.

The story has all the elements of American free enterprise at its best: a determined action based on a need, search and research, picking up where others left off, surprising developments and ramifications way beyond the original concept and objective, the better way of doing things, the making of new jobs, the increase in productivity, plus conservation of a material in short supply.

The research program was sparked by a railroad tank car manufacturer's desire to find a better way of insulating the inside of tank cars against an action known as "iron pickup", plus an increasing demand for special tank cars for transporting chemicals and other fluids which must be kept free from contamination.

Before "Kanigen", such shipments were protected by baking an enamel coating on the inside of the cars. This was perfectly satisfactory chemically, and fully capable of keeping the customers happy.

The fact, however, that it was expensive and of relatively short life, made it a "natural" to toss in the laps of the research department, along with a challenge to come up with something both better and cheaper.

The research boys recognized that the ideal solution would be to plate the inside of the tank, but they recognized the limitations of electroplating and that the porosity of that kind of plating would make it less satisfactory than the baked enamel.

So they decided to play around with chemical plating rather than electroplating. They drew on considerable research that had gone before. Some years ago the U. S. Bureau of Standards had disclosed a method of chemical plating but concluded that their process would not be commercially practical.

Carrying on from there, the "Kanigen" staff refined the process and found the missing links which had prevented chemical plating from becoming a commercially practical and acceptable process.

The next logical step in the program was the setting up of a pilot plant. There, for several months, many tests were run on various base materials and on all sorts of manufactured products.

From there on, "Kanigen", originally destined only for the gloomy interiors of railroad tank cars, began to pay off. They found that the "Kanigen" process has many advantages which cannot be equaled by any other plating process. The fact that many of the advantages were discovered afterward rather than anticipated beforehand does not detract in the least from their value, but further strengthens the case for research and enterprise.

They found that "Kanigen" offers zero porosity. They found that they could put a satisfactory plate on almost anything with a minimum of difficulty; steel, copper, brass, bronze, stainless steel, aluminum, plastics, and magnesium, and with 1/3 to 1/2 the nickel required by other processes. There is conservation of a material currently in short supply.

They found that "Kanigen" will plate any article, with controlled uniformity, regardless of size or shape. They demonstrated that "Kanigen" will plate anywhere that liquid can touch. As an experiment they have thoroughly plated nuts and bolts without taking them apart, and whole valve stems without dissembling them; all crevices and irregular surfaces become uniformly plated. In the field of salvaging expensively machined precision parts, "Kanigen" plating has brought over-machined parts back to the originally specified tolerances.

The many groups, representative of many industrial activities, which have participated in experiments and tests with "Kanigen" indicate that when licenses are granted, new plants, new jobs and new services will result. All this because of a need for better protection for the inside of railroad tank cars.

E. Willard Pennington

editor

Specialists in Designing and Producing Carbide Cutting Tools

WESSON BAND TYPE TOOL HOLDERS

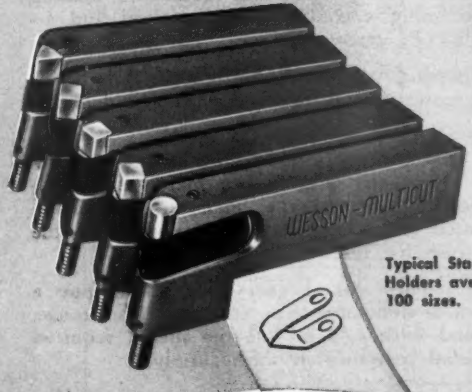
Special and Standard

with replaceable bands at low cost.

Grooving tool used on the Cadillac Tank.

ALL THE WEAR ON THE BAND MEANS EXTRA ECONOMY, EXTRA EFFICIENCY, HOWEVER SIMPLE OR COMPLICATED YOUR TOOL HOLDER PROBLEM!

Multiple insert planer tool used by Caterpillar Tractor.



Typical Standard Wesson Tool Holders available in 10 styles, 100 sizes.

2 insert tool for turning Ford-Lincoln rear axle shaft on a Bullard Man-au-trol.

WESSON

Carbide Cutting Tools

First choice when tough metals are to be cut— for special or standard purposes— for single or multiple set-ups.

WESSON COMPANY 1220 Woodward Heights Boulevard
FERNDALE (DETROIT 20) MICHIGAN
Affiliated with WESSON METAL CORPORATION, Lexington 34, Kentucky

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

WELDMENTS CLICK IN PROCESSING MACHINES

Weldments are widely employed as components of uniits for hydraulic, mechanical and other types of operation, partly because they cost less when quantities are small and also are more readily adaptable to a wide range of uses than are castings.

Johnson & Johnson, one of the larger producers of surgical dressings and related supplies, manufactures and packages its products in several plants, including some of the ultra-modern type recently constructed. Machines employed in these plants are purchased commercially when they are available in satis-

by
G. N. Bull
District Engineer
THE LINCOLN ELECTRIC COMPANY
Newark, New Jersey

factory size and quality. In other cases, however, it is necessary to design and build special machines to meet particular and exacting needs. Engineering work on these special machines is handled by the Central Engineering Department of the company, located in New Brunswick, New Jersey.

In the Central Engineering Department machines are designed, developed and perfected. Many components are purchased but

Fig. 2. Base as it appears after the fixed table is arc welded to it. Vertical walls are formed by a wrap-around welded to the bottom plate.

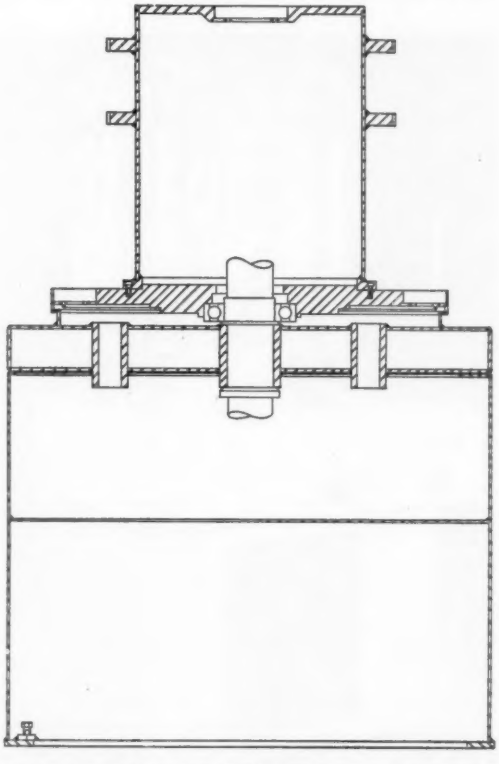


Fig. 1. Vertical section of the capping machine to apply caps to Baby Powder cans designed by engineers at Johnson & Johnson. Most of the major components are steel weldments.

others are built either in the company's own shops or by outside contract shops. In either case, weldments are extensively used because they are economical, they serve their purposes well, and they are readily adaptable to an uncounted number of highly diversified parts. Although cast equivalents could be used in some cases, their use would involve delays and high costs for making the patterns and obtaining the castings, therefore, except in unusual cases weldments are preferred.

A typical example of a machine designed and built by Johnson & Johnson is the hydraulic capper, of which a vertical section

appears in Figure 1. This machine is installed in the company's Baby Products Plant in Cranford, New Jersey, which is one of Johnson & Johnson's latest decentralized plants. The new capper replaced a noisy, overloaded commercial machine which required excessive maintenance.

The decision to operate the new capper hydraulically was made in order to insure quiet performance and to maintain required

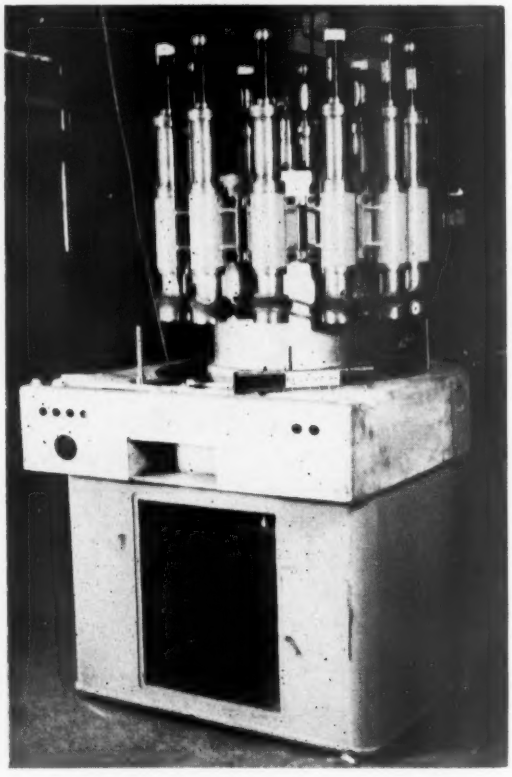


Fig. 3. Partly assembled capper with the turret and hydraulic heads in place but not yet connected to hydraulic lines. The shroud weldment that covers the fixed table is shown in place.

pressure of 400 psi in the cylinders that operate the capping heads. Two hydraulic pumps are used: one supplying fluid at 400 psi to the 1½" Electrol hydraulic cylinders whose pistons operate the capping heads, and the other delivering fluid at 80 psi to a variable speed hydraulic motor that operates the cylinder turret and certain accessories. Both pumps are Vickers vane-type and are driven by the same electric motor. They are not part of the machine itself but are located in the basement below the machine and are mounted on a weldment tank from which the hydraulic fluid is drawn and to which it is drained after use.

In order to give the machine adequate capacity, it is provided with twelve heads which are supported on a turret having a vertical axis parallel to the head axes. The capping heads must be precisely synchronized with the feeding of cans and caps, which is done by driving the turret and star wheels from the same hydraulic motor and by using a fixed cam near the top of the machine to operate the hydraulic cylinder valves as they are carried around by the turret. With this design the hydraulic supply line must be brought up through the axis of the machine to a rotary union through which fluid feeds to a circular manifold. Each cylinder has a flow control valve and a four-way valve equipped with a stem carrying a wheel that follows the cam. Motion of this valve stem controls valves which control, in turn, motions of the double-acting piston, causing it to make a down (working) stroke in applying a cap and a return stroke for each revolution of the turret.

Weldments in the machine include a base, a turret, a supporting table between the base and the turret, a column, twelve heads, a turret cover and a shroud that covers the fixed table and fits flush with the rotating table. This shroud also houses the operating controls and a meter calibrated in cans per minute. All of these have one or more arc welds. Those forming exposed units are given "stream-lined" shapes which contribute much to the appearance of the exterior besides making it easy to keep spotless. External shapes are also designed so that the machine fits perfectly into the line where the machine is an important integrated part.

Largest of the weldments is the base shown in Figure 1 and the assemblies in Figures 2 and 3. This base includes a U-shaped wrap-around with a large radii, a base plate to which the wrap-around is arc welded inside and outside, and a horizontal shelf which is stiffened by a vertical web in order to support the hydraulic driving motor and certain accessories. Bosses welded to the top face of the bottom plate are provided for hold-down bolts. In the flat vertical wall of the wrap-around there is a large opening, shown in Figure 3, which is flanged to receive a removable panel that is flush when in place. Although a similar base might be cast at a much higher cost, the walls would have to

be much thicker, thus greatly increasing the weight and actually affording no advantage.

Two ¼" plates of base contour, spaced 3⅞" between outer faces are the major components of the fixed table of the machine, Figures 1, 2, 3 and 4. These plates are joined by a wrap-around which is arc welded to their contours and are spaced also by tubes which pass through machined holes and are arc welded to the top and bottom plates. This provides a hollow but very stiff table which is further stiffened by a ¼" x 1¼" ring welded to the top plate. The assembly is then welded to the base which is correspondingly stiffened by fastening to the table. The central tube of the table supports the fixed column of the machine, and two other tubes provide passages for shafts to carry driving gears that mesh with a ring gear bolted to the revolving table.

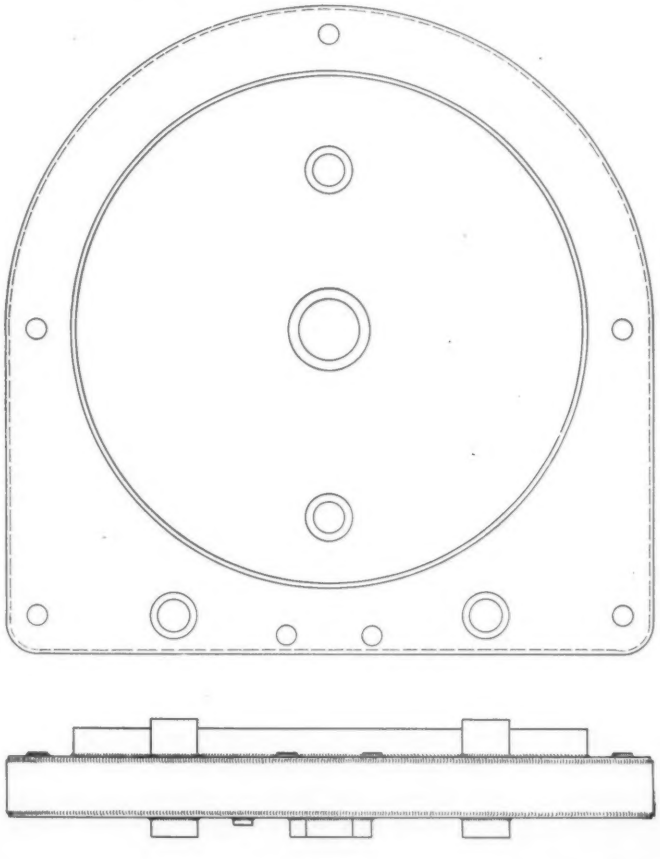
Although the revolving table could be cast, it is flame cut from a 2¾" slab of steel in which recesses are machined for the central bearing, the twelve can pickup magnets, and the gears that are between the revolving table and the fixed one below. A ring gear is bolted to the underface of the revolving table and the lower turret flange to the top face, Figure 5, since the turret turns with the table.

To make the turret weldment, Figures 5, 6, and 7, a ¼" steel sheet, 23" wide, is rolled into a cylinder, and the longitudinal joint is butt welded. A head plate, a bottom flange and two twelve-sided rings, each 1" thick and spaced 6¼" apart center to center are welded to the barrel. Subsequently, the edges of the plates are drilled and tapped to receive the cap screws that fasten the twelve rings to the turret.

Doubtless a similarly shaped casting could be produced, but the patterns alone would be expensive, the casting would weigh much more, and there would be little, if any, saving in machining cost. Since there would be no net gain using a casting, the weldment is preferred.

Each capping head is basically an assembly of tubular members of which only the outer shell, including a flange, is a weldment. This

. . . *Continued on page 88*



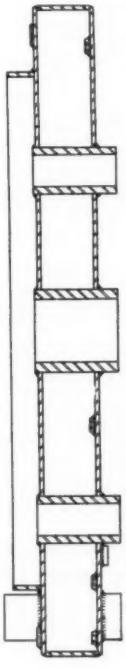


Fig. 4. Drawing of the fixed table that fits into and is subsequently arc welded to the base. The central tube supports the column about which the turret turns in ball bearings. Other tubes are for gear shifts. All are joined by arc welds.

Introduction

Many of the wrought aluminum alloys, the chemical composition of which are listed in Table 1, possess excellent machining characteristics; this property being advantageously employed in the production of intricate machined parts. Where the automatic screw machine is to be employed, as exemplified by the single spindle Brown & Sharpe automatic, the alloy type normally recommended [1,2] would either be 11S-T3, 17S-T4 or 24S-T3. These alloy types are among the strongest and are suited for a wide variety of applications with the exception where the specific application requires either special forming properties, high electrical conductivity or high resistance to corrosion.

MACHINING THE ALUMINUM ALLOYS WITH CARBIDE TIPPED TOOLS

by Lester F. Spencer
Chief Metallurgist,
LANDERS FRARY & CLARK,
New Britain, Conn.

Although the main theme of this discussion is on the use of carbides as a tool material in machining the aluminum base alloys, it may be well to mention those properties which are considered[2] of importance to machining, thus:

(a) High thermal conductivity. The heat generated by turning is rapidly conducted away from the point of the tool.

(b) Low resistance to penetration.

(c) Relatively low notch and impact strength.

(d) Low modulus of elasticity and low shear modulus. The above three factors as indicated by (b), (c) and (d) facilitate cutting and reduce the energy required to machine.

(e) Relative high coefficient of friction on steel. Polished tool surfaces and good lubrication compensate for this factor.

(f) Lightness which reduces inertia forces when machining large stock at high speeds.

Although the term 'machinability' is a comparatively relative term which is rather hard to define, the practical shop man will form a definite opinion of the various alloys under the conditions of individual shop practice. Thus, in general, he will consider machinability on the basis of such factors as chip characteristics, ease of cutting, quality of finish and tool life. This evaluation of machinability may also vary in accordance with such factors as the chemical composition, the physical form (cast or wrought) and the temper. Thus, referring again to Table 1, the commercial aluminum alloys are segregated into groups, depending upon whether they are cast or wrought, heat treated or not heat treated; each group being rated in regards to machinability. The machinability characteristics of Group or Type III alloys are good; those of Type II alloys are better; and, those of Type I alloys are best.

In addition, the inexperienced operator may find that difficulty in obtaining dimensional accuracy is experienced; this difficulty being present to some degree on all types of aluminum alloys. However, it should be remembered that the aluminum alloys will expand or contract about twice as much as steel for a given change in temperature. This value will, of course, vary with the alloy type; however, as a general rule, this expansion or contraction will be about 0.0001 inches per inch of aluminum per every 8 degrees Fahr. change in temperature. Thus, the only method for maintaining dimensional accuracy in the finished work is to minimize generated heat during machining by the proper use of lubricants and the maintenance of keen cutting edges.

Machinability of the Aluminum Alloys

Those alloys identified as 2S and 3S are known for their "gummy" chips; the turnings being long and continuous which may offer

Type*	Alloy	Alloying Elements, Per Cent (a)					
		Copper	Silicon	Magnesium	Manganese	Zinc	Others
NONHEAT-TREATED CASTING ALLOYS							
I	C113	7.0	3.5	.....	.....	.....	.....
II	112	7.0	.....	.....	.....	1.7	.....
	113	7.0	2.0	.....	.....	1.7	.....
	A214	.....	.....	3.8	.....	1.8	.....
	138	10.0	4.0	0.3	.....	.....	.....
	214	.....	.....	3.8	.....	.....	.....
	212	8.0	1.2	.....	.....	.....	.....
	F214	.....	0.5	3.8	.....	.....	.....
	B214	.....	1.8	3.8	.....	.....	.....
III	A108	4.5	5.5	.....	.....	.....	.....
	108	4.0	3.0	.....	.....	.....	.....
	319	3.5	6.3	.....	.....	.....	.....
	43	.....	5.0	.....	.....	.....	.....
HEAT-TREATED CASTING ALLOYS* **							
I	750	1.0	.....	.....	.....	.....	1.0 Nickel + 6.5 Tin
	220	.....	.....	10.0	.....	.....	.....
	122	10.0	.....	0.2	.....	.....	.....
II	142	4.0	.....	1.5	.....	.....	2.0 Nickel
	195	4.5	0.8	.....	.....	.....	.....
	B195	4.5	2.5	.....	.....	.....	.....
III	355	1.3	5.0	0.5	.....	.....	.....
	319	3.5	6.3	.....	.....	.....	.....
	356	.....	7.0	0.3	.....	.....	.....
	D132**	3.5	9.0	0.8	.....	.....	0.8 Nickel
	A132**	0.8	12.0	1.2	.....	.....	2.5 Nickel
NONHEAT-TREATED WROUGHT ALLOYS* **							
II	56S	.....	.....	5.2	0.1	.....	0.1 Chromium
III	52S	.....	.....	2.5	.....	.....	0.25 Chromium
	4S	.....	.....	1.0	1.2	.....	.....
	3S	.....	.....	.....	1.2	.....	.....
	2S	.....	.....	.....	.....	.....	.....
	EC	.....	.....	.....	.....	.....	.....
HEAT-TREATED WROUGHT ALLOYS* **							
I	11S	5.5	.....	.....	.....	.....	0.5 Lead + 0.5 Bismuth
II	17S	4.0	.....	0.5	0.5	.....	.....
	24S	4.5	.....	1.5	0.6	.....	.....
	14S	4.4	0.8	0.4	0.8	.....	.....
	75S	1.6	.....	2.5	0.2	5.6	0.3 Chromium
	25S	4.5	0.8	.....	0.8	.....	.....
	19S	4.0	.....	0.6	.....	.....	2.0 Nickel
III	61S	0.25	0.6	1.0	.....	.....	0.25 Chromium
	53S	.....	0.7	1.3	.....	.....	0.25 Chromium
	63S	.....	0.4	0.7	.....	.....	.....
	A51S	.....	1.0	0.6	.....	.....	0.25 Chromium
	32S**	0.9	12.2	1.1	.....	.....	0.9 Nickel

TABLE I. Nominal composition and Relative Machinability of Commercial Aluminum Alloys.[1]

* Indicates relative machinability. Type III Good; Type II Better; Type I Best.
** Alloy cuts freely, but tool may wear excessively if not tipped with cemented carbides.
*** Machinability based on heat-treated or strain-hardened products. All alloys in annealed temper are in Type III.
Note (a) Aluminum and normal impurities constitute remainder.
Note: 2S—99 percent minimum aluminum. EC—99.45 percent minimum aluminum.

difficulties in both chip removal or even quality of finish. However, where it is necessary to machine these alloys, improvement in machinability is obtained by the use of an alloy which has been cold worked; preferably the full hard temper being specified. In addition, tool design will vary to the extent that large top and side rake angles are employed and that the cutting tools have a properly finished, smooth surface with keen cutting edges. Of the two alloys, type 3S will undoubtedly offer the greater difficulty. Alloy 56S, which is rated as a Type II alloy, will not present as great a problem in chip disposal, since greater break-up of chips is realized than with the other alloy types of this group.

These alloys are normally termed the "non-heat treatable" types, and when compared to the "heat treatable" alloy types, a favorable comparison cannot be given. Thus, the heat treatable alloys have a better machinability factor, even though the machinability of the alloys will vary within the group. However, a greater resistance to tool penetration is experienced due to the higher strength exhibited by these alloys.

As mentioned previously, the machinability of those heat treatable alloys such as 17S-T4, 24S-T3 and 11S-T3 is sufficiently good so as

to utilize the high speeds that are obtainable on automatic equipment. As is indicated by the nomenclature, maximum machinability is obtained in these alloy types only when they are in the heat treated condition. Alloy 11S-T3 is considered the most free-cutting of the aluminum alloys; this material having both lead and bismuth to serve as chip breaking elements. Both alloys 17S-T4 and 24S-T3 are almost equal in machinability as compared to alloy 11S-T3, but chip formation may be a problem. Thus, in these two alloy types, the chips are long and stringy and may require the use of a suitable chip breaker with the cutting tool.

Those alloys which contain silicon as an alloying element presents definite difficulties in machining; these difficulties increasing as the silicon content increases. Thus, not only do these alloy types offer greater resistance to tool penetration than that experienced with any other alloy combination, but also, rapid tool wear will be realized. None of the alloys containing over five percent silicon will finish to the bright machined surface obtained on other strong aluminum alloys ([2]), but will have a slightly gray surface with little luster. Chips will have a tendency to tear rather than shear from the work and precautions are usually necessary to reduce the tendency for burrs to build up on the tool tip.

Our experience with the silicon type alloys have been with die castings. Thus, the high silicon alloys are usually preferred as die castings due to the increase of fluidity realized and the subsequent high yield of perfect castings. On the debit side of these high silicon die casting alloys is the fact that considerable difficulty may be experienced upon machining. In addition, due to the presence of hard free silicon particles which may be dispersed throughout the matrix of the alloy, both excessive tool wear and breakage of tools may be experienced. In our particular case, tool breakage has been quite prevalent in the drilling of small diameter holes to a depth of one inch or more. Thus, in order to circumvent these known difficulties of tooling, the use of carbide tooling has been given consideration whenever the tool design will permit the use of this material.

Carbide Tooling

The property of extreme hardness of cemented carbides can be used to advantage in the promotion of longer tool life than is realized with a comparable tool made from high speed steel. Thus, the well known characteristic of wear resistance will counteract the dulling effect of these hard free silicon particles. However, judicial choice of carbide in accordance to a specific tool design is usually imperative since a weakness of the carbide materials is their poor impact properties. Thus, where factors of tool design or procedures employed in machining cause impact, tool breakage of the carbide tool may be even greater than that experienced in the use of high speed steel tooling.

Thus, the initial thought in the use of carbide tooling for any specific operation would be the practicability of carbides; this decision being dependent upon such factors as, (a) the degree of support that can be given to the carbide tip; (b) the rigidity that is given by machine design to the tool holder, the machine slides, etc.; (c) the type of cut, whether it be a straight cutting or an interrupted cut; (d) the type of operation whether it be drilling, boring, reaming, etc.; and, (e) the limitations that may be found in regard to either speed of operation or power which may be characteristic of either the equipment or the tool setup. In the latter instance, the tool setup, as exemplified in multiple tooling of a single spindle Brown & Sharpe where both high speed and carbide tooling are employed, the speed limitation will be that established for the high speed steel tooling on the slowest operation within the operational sequence.

Maximum support of the carbide tip is essential; this fact precluding a cutting angle greater than that normally employed either on the plain carbon or the high speed steels. This subject of support for the carbide tip is especially important where interrupted cuts will be made such as in the turning of either square or hexagonal stock; failure to consider this may often result in excessive tool breakage. In addition, recommended rake and clearances angles that are usually given by either the vendors of carbide tools or the material supplier, should be used as a guide; deviations from these values being made in accordance to the requirements of a specific job.

Carbide tools should have a fine, lapped surface; diamond lapping usually being the preferred whenever possible ([2]). Thus, the degree of finish will be a definite factor in determining the life of the tool. It has been stated ([3]) that the life of a tool having a lapped or polished tip may be several times that of a tool that has been ground coarser

and, in addition, the resultant workpiece finish will be better.

The carbide usually employed in the machining of the non-ferrous materials, with which the aluminum base alloys would be included, is the straight tungsten carbide which have been sintered with cobalt as the binder. As is indicated in Table 2, there are four suggested grades; both the approximate chemical composition and some properties also being included ([6]). As a guide to selection, the following comments may be in order: thus:—

(a) The composition as indicated by "A" is the strongest tungsten carbide grade that is stocked in all standard sizes; this grade being particularly advantageous for use as a tool bit in roughing operations at moderate speeds.

(b) The composition as indicated by "B" can be considered as the most versatile within the group; this type being used for general turning, facing and boring operations on the aluminum alloys with cutting speeds varying from 450 to 900 feet per minute. This recommended speed range is quite broad, however any specific speed must necessarily depend upon such conditions as the material type, the depth of cut, the feed, condition of equipment, etc. This grade of carbide has also been used with considerable success in operations such as drilling and reaming.

(c) The composition as indicated by "C" is particularly suited to light finishing cuts under conditions of fine feeds and high speeds. Thus, this grade is employed in operations such as turning, boring and facing with operating speeds varying from 750 to 1000 feet per minute.

(d) The composition as indicated by "D" is a very wear resistant tungsten carbide. This grade is considered a "special", and is usually employed in the small tip sizes since it is quite sensitive to shock, brazing and grinding stresses. It is used principally in precision boring and other fine finishing work. Light steady cuts are recommended with fine feeds and high speeds. Thus, in operations such as turning, facing and boring precision work, the speeds may vary from 1000 to 1500 feet per minute.

Although specially designed carbide tips are available, it must be realized that the use of standard blank sizes will effect both time and cost savings that cannot be overlooked. Also, where carbide tooling seems to be feasible on an economic basis, the choice of the proper carbide grade along with such factors as tool design and operational factors can be obtained from a technical representative of a reputable carbide manufacturer. Be sure to benefit from the wide experience that the carbide tool engineer has accumulated.

Type	Approximate Chemical Composition, %			Grain Size	Hardness		Transverse Rupture Strength, psi
	Cobalt	Tungsten Carbide	Tantalum Carbide		Rockwell 'A'	Rockwell 'B'	
A	6.25	93.75	....	Medium Coarse	90.5	76	360,000
B	6.50	90.50	3.0	Medium Fine	91.5	78	250,000
C	4.50	95.50	....	Fine	92.0	79.5	210,000
D	3.00	97.00	....	Fine	92.5	80	200,000

TABLE II. Grades of Carbide Recommended for the Machining of the Aluminum Alloys.

Courtesy: Firth Sterling, Pittsburgh, Pa.

Tooling Operations

It should be remembered that carbide tipped cutting tools may be employed for the machining of all the aluminum alloy types; the decision in the use of this more expensive tool material being on the basis of the advantages gained in a specific application. The discussion that follows covers the recommended procedures in the machining of most aluminum alloys, and, as previously stated, this information is usable as a guide in determining the specific factors of tool angles for the intended job.

In the use of carbides as a tooling material in turning operations, the rake angles are usually smaller than those used for high speed tooling. As is indicated in Table 3, this specific rake angle is dependent to a large extent on the specific alloy that is to be machined. In order to provide sufficient support for this brittle tool tip, it is also recommended ([2]) that the cutting angle, "a", be not less than 65 degrees where either heavy cuts are to be made or where the harder types of aluminum alloys are to be machined. Thus, again refer-

. . . *Continued on page 60*

Wheel Preparation and Related Grinding Problems

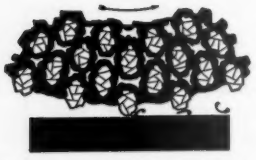


Fig. 1. Each cutting particle in the wheel is a miniature cutting tool, the edges of which become dulled in use. The diamond dresser fractures the matrix holding these particles which fall out or are knocked out thereby exposing a layer of new sharp particles.

In too many instances, the relationship of good results in surface grinding to proper preparation of the wheel is not realized. Too often the operator cusses the grinder or anything else handy when good results are easily within his reach. And very often, correction of such grinding difficulties involves the relative simple expedient of preparing the wheel properly.

To the above assertion the normal, healthy, red-blooded grinder operator will say "Nuts! Anyone knows what little there is to know about preparing the wheel." This is a normal reaction but it is on the so-called simple matters where significant facts go unnoticed. It is the purpose of this discussion to examine the various wheel preparation operations and their relationship to good results in surface grinding.

Wheel Preparation Operations

In preparing a wheel, the operator strives, in essence, to satisfy several or all of the following requirements:

(1) The need for "truing" the wheel.

This is the most vital requirement affecting results in surface grinding. Truing involves essentially the maintenance of two relationships. One relationship is the concentricity of the wheel periphery with respect to the exact center of the spindle; the other is the relationship of the wheel periphery with the **travel** peculiarities of the working surface of the grinder right at the point of work. These relationships must be "true", otherwise "chatter" and inaccuracy will result, as explained later in this discussion. The full importance of truing is not generally appreciated and the operator frequently concentrates on other aspects of wheel preparation and does not give enough attention to this fundamental requirement for truing the wheel.

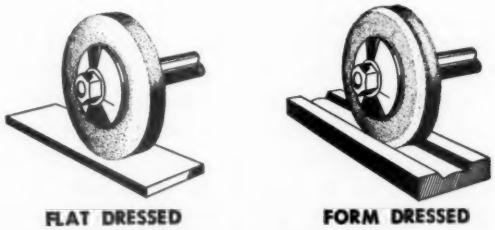
by M. A. Bergson
Engineer,
The DoAll Company,
Des Plaines, Illinois

(2) The need for obtaining a sharp, efficient cutting surface on the wheel.

Grinding wheels are composed of very hard crystals bonded together with a more friable (crumbly) material. Each crystal is a miniature cutting tool, the sharp, jagged edges of which take minute chips out of the work, Figure 1. As a wheel is used, these sharp edges are worn or broken away and the pores in the wheel face fill up with the work chips. Thus, the cutting effectiveness of the wheel decreases, and carried to the extreme, the wheel would cease to cut or grind but would merely burnish and burn the work. When the wheel is "dressed" the used surface is broken away and fresh material is exposed which contains unused crystals having sharp edges. In this manner cutting efficiency is restored.

(3) The need for forming, i.e., shaping the wheel, for grinding shapes.

The principle of grinding material to a form with a shaped wheel, Figure 2, is coming into wider and wider use because of the rapidity of production and fine finish obtained without the need for subsequent finish machining. A dressing diamond mounted on an appropriate dressing fixture and fastened to the grinder table is one means of dressing a form onto the periphery of the wheel. The



FLAT DRESSED FORM DRESSED

Fig. 2. Showing flat and form dressed wheels.

diamond can be swung in calibrated arcs and planes to obtain the desired form.

Another method involves the use of shaped steel rolls, Figure 8, which move against the wheel under pressure and crush off certain areas of it to achieve the desired peripheral form. The crush method can also be used for flat dressing, although this is not usually the case.

It should be noted here that the truing, dressing or forming of grinding wheels is essentially a destructive process in which a certain amount of existing wheel material is broken away. A diamond, crush roll or other kind of tool may be used for this purpose.

Factors Affecting Wheel Truing and Dressing

A properly trued and dressed wheel is a major step toward the achievement of accuracy and good finish in the work plus economy in the use of the wheel. Such operational results, however, also depend on other factors which include choice of the proper wheel for the work, rigidity and accuracy of the grinder and the spindle. These qualities of a grinder are vital in being able to true and dress the wheel properly. Obviously, play and excessive run-out in the spindle, lack of rigidity in the column, etc., can make it virtually impossible to obtain a wheel of true concentricity and of sufficient stability for smooth finish and accurate surface grinding. Grinders, therefore, should be ruggedly constructed and checked at regular intervals to detemine that these basic requirements are within the expected tolerances.

Fit of the grinding wheel to the spindle is also very important but this is usually taken care of adequately by the adapter which fits the wheel to the spindle. Ordinarily, the slight amount of inaccuracy (lack of concentricity) between the wheel and the spindle is of no concern since this is readily compensated for in the truing process. It involves, of course, the removal of wheel material in certain areas to obtain the full concentric form, Figure 3. In the case of diamond wheels, however, which are notoriously expensive, this initial lack of concentricity is important since the small amounts of material removed represent a considerable investment. Therefore, in the case of diamond wheels it is always desirable to align the wheel as closely as possible to obtain full concentricity. This can be done in several accepted ways, one involving the use of a dynamic balancer and the other by means of a dial indicator.

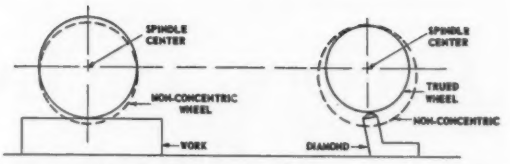


Fig. 3. Exaggerated demonstration showing effect of non-concentricity between wheel and spindle. Non-concentric wheel will gouge work at one point in revolution or miss it at another point resulting in inconsistent, rough finish. Truing removes material at high spots "truing" wheel to spindle center.

Insofar as the processes of truing and dressing are concerned, this discussion will deal with the techniques used for grinders with chuck sizes of 6″ x 18″ to 10″ x 30″.

Truing and Flat Dressing

This discussion will deal primarily with the truing and dressing of a "flat" wheel since that is the most common wheel form in surface grinding and will therefore serve to illustrate the considerations involved. The term "flat" as used here denotes a condition where the wheel face is flat instead of shaped.

Diamonds are generally used for truing and flat dressing wheels. Often both operations are accomplished simultaneously since the same tool is used and in a similar fashion. However, it is emphasized that different objectives are involved in each operation and after a wheel has been trued it may or may not be dressed as required. Always, however, truing must be the prime consideration, although in performing the truing operation the desired "dress" can also be considered and both operations accomplished simultaneously.

The diamond used for truing and dressing is brazed into a setting and this setting is placed in a holder that mounts on the grinder table or the chuck surface. It is not ordinarily advisable to mount the diamond tool on the wheel housing since the work rests on the table or the chuck, and in truing and dressing it is desirable to maintain the same relationship between the diamond and the wheel that will exist between the work and the wheel. In this regard the position of the diamond on the table with respect to the wheel is important for assuring wheel concentricity **right at the point of work.**

Consider, for example, what occurs if the periphery of the wheel is not concentric ("in round") with the spindle at point of work. The pressure of the wheel against the work

. . . *Continued on page 62*

GRINDING AND LAPPING STRESSES
. . . in Manganese Oil Hardening Tool Steel

by Dr. Harold R. Letner
and
Harold Jack Snyder
MELLON INSTITUTE
OF INDUSTRIAL RESEARCH
Pittsburgh, Pennsylvania

THERE IS INCREASING INTEREST EXPRESSED in the residual stresses caused by grinding or lapping, because of the influence which they may have upon the service life of tools and parts finished by these processes. Although various opinions have been expressed concerning the nature of these stresses and their causes, only a few investigators have published actual stress distributions resulting from these operations. This is due partly to the time required to obtain reliable stress data and partly to the overworked assumption that nominal stresses inferred from residual bending moments are a satisfactory indication of the actual stress state in the surface.

A number of investigators have observed the residual bending resulting from machining, grinding, and polishing; but, most of these have measured the effect of but one component of a stress system which is at least biaxial.

The biaxial stress distributions resulting from grinding and lapping annealed manganese oil-hardening tool steel were determined by sectioning the stressed surface layers and following the changes in curvature of the test specimens by optical interferometry. Two methods of sectioning — lapping and chemical etching — were tested and evaluated. The study shows that the plastic deformation which gives rise to the residual stress is at least partially due to mechanical forces exerted upon the surface by the abrasive grains and cannot be explained by forces of thermal origin alone. Grinding stresses were found to fluctuate rapidly close to the surface, the highest stresses being confined to a surface layer about 0.0001″ thick. Depth of stress penetration increased with depth of cut over the range tested. Lapping stresses were found to have a nearly constant compressive value throughout the surface layer, which was about 0.0002″ thick.

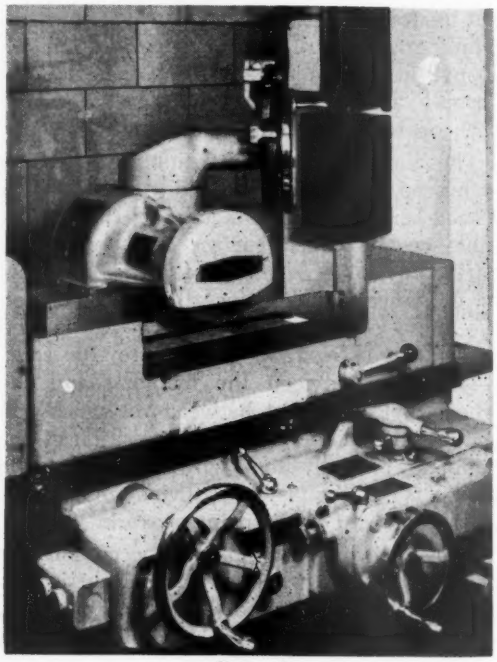


Figure 1

In the past, severe grinding conditions have often been employed in order to obtain measurable results. Use of the optical interference technique not only avoids the necessity for exceeding recommended grinding practice but also permits simultaneous measurement of the principal components of the biaxial surface stress.

Specimen Preparation

Manganese oil-hardening tool steel was selected as the specimen material because of its wide use in industry and because of its alleged sensitivity to grinding injury. Two-inch square specimens were cut from ¼″x 2″ annealed bar stock, and placed on the mag-

This article is adapted from a paper presented by the authors at the recent Annual Meeting, American Society of Mechanical Engineers. It describes research conducted under the L. Leslie Byers Memorial Fellowship sustained by the Grinding Wheel Institute.—W. N. N., Tech. Ed.

netic chuck of a grinder in groups of six, surrounded by ¼"x 1" bars of the same material (Fig. 1). Approximately 0.015" was gently ground from each side of the specimens and surrounding bars to remove any decarburized material.

Specimens were subjected to a stress relief anneal in an automatically-controlled electric furnace in order to remove any machining or grinding stresses introduced during their preparation. Those for the lapping and the first grinding test were placed in a salt bath, while those for the second grinding test were packed in sillimanite.

After pickling, one surface of each specimen was lapped flat (Fig. 2), employing a mixture of 800-grit aluminum oxide in oil fed onto a rotating cast iron plate. The lapped surfaces were rubbed lightly on 4/0 metallurgical emery paper to give them sufficient reflectivity to produce sharp interference patterns when placed in contact with a quartz optical flat and illuminated with sodium light.

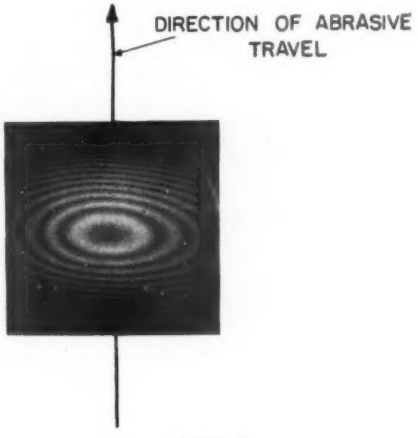


Figure 3

Grinding Tests

Grinding tests were conducted on a 6"x 18" horizontal spindle surface grinder with hydraulic table drive (Fig. 1). Six simultaneously prepared specimens were placed on the magnetic chuck surrounded by the same 1" bars used previously. With the polished "reference" surface of each specimen adjacent to the magnetic chuck, all test grinding was done on the opposite surface. By utilizing 0.001" paper shims and the slight inequalities in thickness caused by preparation of the reference surfaces, the specimens were arranged so that each traverse produced six different depths of cut.

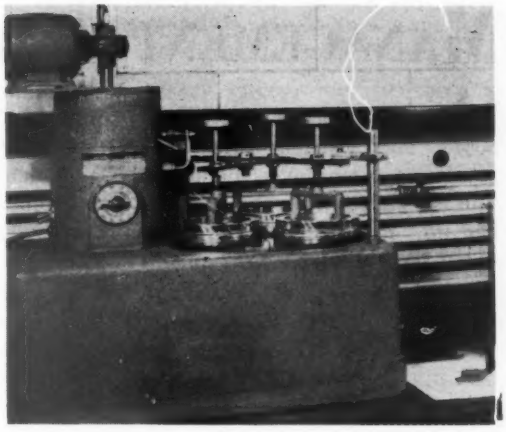


Figure 2

The wheel specifications and grinding conditions were as follows:

Wheel: 8" x ½" x 1¼", J-grade, medium structure, vitrified bond containing 48% by volume of 46-grit white fused aluminum oxide abrasive.

Wheel speed (peripheral): 6000 ft/min (idling)

Traverse speed: 50 ft/min.

Crossfeed: 0.050" at each end of traverse

Grinding fluid: air

The wheel was dressed with a sharp diamond prior to each test. Mean wheel depths-of-cut were calculated from the weight losses of the specimens during grinding, the area ground, and the density of the steel. Uniformity of the cut over the entire surface of each specimen was checked by micrometer before and after grinding.

. . . *Continued on page 68*

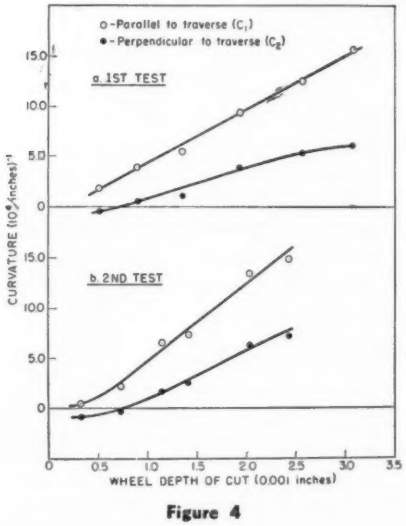


Figure 4

MANAGEMENT TRAINING FOR FOREMEN

OVER THE PAST TWENTY YEARS many foreman training programs have been planned, proposed, and written with the emphasis on psychology, employee handling and evaluation; in short, with the "how to win friends and influence people" approach as the answer to all the foreman's problems.

Our approach to Foreman Training is drastically different. True, every foreman must have the social graces and some qualities and know-how for successful leadership, but wide smiles, lavish praise, familiarity with first names and "how's the family, Joe?" conversations with employees are not the basic for efficient management at the foreman level.

How well are your foremen spending your money? Your foremen are responsible for an approximate investment of $3000 for each employee plus approximately an additional $3000 to $20,000 for each employee's tools, equipment, etc. Simple arithmetic shows the foreman with 25 to 50 employees in his department to be responsible for the effective use of approximately $300,000 to a million dollars per year. With this kind of responsibility it is only good business sense that the foreman needs more than personality and supervisory ability, he needs all the skills and know-how of modern executive management.

It is the objective of our philosophy to make the foreman a businessman, in effect to get the foreman to realize that he should run his department as though in business for himself. To be in business for himself, the foreman must have the proper tools of business, know the proper way to use them and have the authority to make his own decisions.

Typical Weekly Dollars Spent For Maintenance LAST YEAR Authorized By Chief Engineer Independent of Productive Dept. Supervision	Typical Weekly Dollars Spent For Maintenance THIS YEAR Authorized By Productive Dept. Supervision According To Scheduled Production	Net Reduction In Weekly Maintenance Expenditure
$9080	$4843	$4237
9143	6010	3133
9035	5570	3465
10129	5404	4725

Foremen at one time in American industry used to plan the scheduling, do the hiring and firing, supervise inspection and timekeeping and be their own process engineers. Eventually as companies grew, these functions in the larger plants became departmentalized and the foreman relinquished his authority and became a straw-boss and no more. With authority divided, responsibility for department profits or losses were not clearly defined. If poor scheduling resulted in inefficient production, the foreman felt it was not his responsibility. If quality control was too rigid, that was tough, but there was nothing the foreman could do but meet it.

Ninety-five percent of all foremen do not understand what authority they inherently possess.

Let's analyze a typical foreman for a moment. He considers himself a department head with responsibility over direct employees for getting out production. He's the last executive on the firing line under the direct supervision of the plant manager. He takes orders from scheduling, he's told what to do by inspection, personnel sends him new employees and transfers his existing help, maintenance tells him what equipment will be repaired and when. Timekeeping, factory accounting, process engineering, all of these advisory and service departments attempt to infringe on his real authority and his right to operate his department as a management executive.

This faulty concept of the foreman's authority and his executive function exists in the majority of plants in America today. It results in buck-passing, red-tape, and general inefficiency at the firing line level; the real profit-making level of industry.

Here is our philosophy of foremanship. The foreman must be able to run his department as a proprietor runs his business. The foreman should be held responsible for all the men, money, machines and materials represented by his department and for the prime purpose of contributing to the profits of the company.

In order to fix responsibility it is necessary to understand the delegation of various functions and their relationships to each other. To this end we consider the non-pro-

by M. K. Sheppard
Management Consultant
M. K. SHEPPARD & COMPANY
Cleveland, Ohio

ductive functions at the operating level such as personnel, labor relations, methods, process and standards engineering, scheduling, factory accounting, quality control, timekeeping, etc. as **Advisory Functions** to aid production. As such these functions should not dictate or usurp any foreman responsibility. In like manner, we consider purchasing, tool making, maintenance, material handling, etc. as **Service Functions** also without authority to dictate or usurp foreman responsibility, but with the basic objective of giving productive department foreman adequate service at reasonable cost. In effect all these services are charged to the profit-making production departments under foreman authority. Since these services are costed to production, the foreman in effect is buying advice from the advisory departments and service from the service departments.

Supposing scheduling tells a foreman "run 20 pieces on this order today". In the majority of plants in America today the foreman accepts this statement as an order. He stops production on a machine. He spends hours of setup time to prepare the machine for production and then runs the 20 pieces, most likely at a loss. The same job may be repeated in a few days at the same loss.

As the responsible direct-line, executive authority in his department, our foreman has the right to accept or reject the proposed scheduling. Perhaps it is truly necessary to run the 20 pieces today. If so, the failure to do so rests squarely on the foreman's shoulders. However, just as the foreman is responsible for operating profits or losses in his department, it is within his authority to veto the high cost scheduling and to reschedule at a more opportune time. Scheduling cannot usurp this authority because they are never charged with the foreman's profit or loss.

Maintenance tells the foreman "your number 2 milling machine's in bad shape and we're going to repair it tomorrow." Our foreman might likely say, "Oh no you're not, Buster, that machine keeps running till next Saturday, then you fix it." Maybe maintenance is right; the machine can't run till Saturday, but it has to be the foreman's decision and responsibility. If the foreman is charged with the responsibility of making a departmental profit, he must make the decisions that will affect that profit. Consequently he may rather pay the maintenance crew time and a half on Saturday than to lose valuable production time that could mean loss of departmental profits.

Strong medicine you say, but without authority you can't fix responsibility and without fixed responsibility good management goes out the window and so do the profits.

. . . Continued on page 109

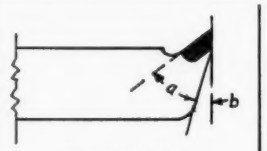
A foreman training group in session at Towmotor Corporation, Cleveland. The author, M. K. Sheppard, (center, rear) leads the discussion.

. . . Machining Aluminum, from page 53

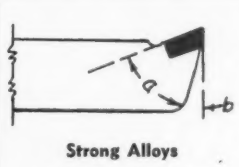
ing to Table 3, the common alloys are the non-heat treatable alloy types previously listed in Table 1, whereas the stronger alloy types are the heat treatable types as exemplified by 11S-T3, 24S-T4 and 17S-T3. As is indicated, the cutting angle increases in the "hard to machine" silicon type aluminum alloys in proportion to the silicon content; the angles ranging from approximately 68 to as high as 80 degrees.

realized being far in excess of that previously experienced with the use of high speed milling cutters.

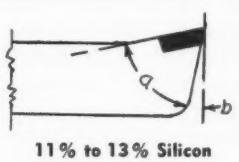
Carbide tipped inserted tooth cutters are also excellent on other alloy types, especially where interrupted cuts make the work difficut. Tooth spacing should be approximately one tooth per inch of diameter or fewer. Recommended angles ([2]) will vary, however the limits advised would be as follows: (a) a cutting angle of 68 to 97 degrees; (b) a top



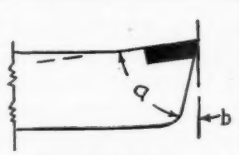
Common Alloys
a=52 to 60 deg.



Strong Alloys
a=60 to 65 deg.



11% to 13% Silicon Alloys
a=68 to 72 deg.



Over 13% Silicon
a=75 to 80 deg.

RECOMMENDED TOOL ANGLES

1. Cutting Angle	52 to 80 deg.	4. Side Rake Angle	5 to 10 deg.
2. Top Rake Angle	32 to 0 deg.	5. Side Clearance Angle	6 to 10 deg.
3. Front Clearance Angle	6 to 10 deg.		

Roughing Operation				Finishing Operation			
Alloy Type	Cut, Inches	Cutting Speed ft., min.	Feed, In./rev.	Alloy Type	Cut, Inches	Cutting Speed ft., min.	Feed, In./rev.
Soft	Up to 0.250	4000 to 7000	Up to 0.012	Soft	Up to 0.020	6000 to 8000	Up to 0.006
Hard	Up to 0.200	500 to 1300	Up to 0.010	Hard	Up to 0.020	700 to 2500	Up to 0.010
High Silicon	Up to 0.120	500 to 1000	Up to 0.008	High Silicon	Up to 0.020	500 to 1500	Up to 0.004

TABLE III. Recommended Machining Practices.[2]

In grinding the clearances on these tools, the front and side tip clearance angles should be kept as small as the work will permit. Another factor to observe is that the shank to which the carbide tip is attached be thicker than that used on a comparable high speed tool; this increase in thickness being at least equal to the thickness ([2]) of the carbide tip. This precaution is advised in order to compensate for the lower transverse rupture strength of the carbide tip.

In milling operations, our experience has mainly been in the milling of the high silicon die cast aluminum alloy. Thus, in the production of a small motor housing made from a 10.0 percent silicon-aluminum alloy, comparable to Alcoa alloy 380, successful application has been made of carbide tipped milling cutters. This is a straddle milling operation where two cutters are spaced so that two parallel sides are milled to size; the tool life

rake angle of minus 10 to 15 degrees; (c) a primary clearance angle of 3 to 7 degrees; (d) a secondary clearance angle of 7 to 12 degrees; and a spiral or helix angle of minus 10 to 20 degrees. For roughing work, the cutter speed will vary from 3,000 to 15,000 feet per minute with a depth of cut at a maximum of 0.0250 to 0.300 inches depending upon the alloy to be machined. This relationship between speed and depth of cut will vary; where the depth of cut is great, the speed usually will be of a low value, whereas, where the depth of cut is light, the speed may be increased correspondingly. The feed may be up to 20 feet per minute or 0.004 to 0.020 inches per tooth. In finishing operations, the data as given above will generally hold true with the exception that the maximum depth of cut will be approximately 0.020 inches. Thus, it can be stated that the use of carbide

. . . Continued on page 66

Grinding Carbon Rods

an unusual centerless job with the usual CINCINNATI ADVANTAGES

The grinding wheel has been removed to show the equipment for grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder. This setup is applicable to grinding other material having the approximate consistency of carbon rods.

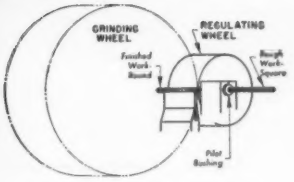


Diagram showing principle of operation, grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

FILMATIC

Unusual applications are becoming more commonplace for the versatile CINCINNATI FILMATIC No. 2 Centerless Grinder. Now, carbon rods are rough ground from square to round in one pass, at a thrufeed rate of 20 feet per minute. Then a finish grinding operation on a No 2 Centerless produces accurate roundness and sizing within .0005". Small diameter carbon rods, below ½", are usually ground in three or four passes. ¶Shops that discard old grinding methods and assign their work to CINCINNATI FILMATIC Centerless Grinders can count on these advantages:

a) Little or no down time, because of FILMATIC grinding wheel spindle bearings and other features of sound engineering.

b) Simple changing of wheels and work rest blades.

c) Close limits of accuracy, promoted by rugged construction and sensitive slide adjustment.

d) Simple, easy to operate.

You may not be interested in grinding carbon rods, but you can't overlook the advantages of low-cost precision grinding offered by CINCINNATI FILMATIC No. 2 Centerless Grinders. ¶Why not re-examine your cylindrical grinding operations with the idea of improving results through the centerless method of grinding. Catalog No. G-611 gives you complete details of these reliable, low-cost producers.

CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-611.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Wheel Preparation, from page 55

will vary in accordance with the lack of concentricity and the wheel will bounce violently at times against the work and at other times may not touch the work at all. Consequently, cutting will be uneven and a poor work surface finish will be obtained, undoubtedly with "chatter" marks, burns and cracks. Only when the wheel is perfectly concentric with respect to the work, can the smooth even cutting be obtained that is so vital for good finish and appearance. Where these "true" relationships are not maintained, uneconomical wearing of the wheel also results.

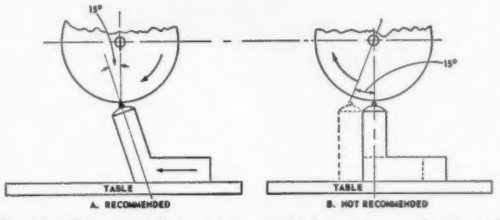


Fig. 4. Demonstrating point at which to dress wheel, and angle of dresser diamond.

Thus, for the proper maintenance of these relationships the diamond point should be so placed that it contacts the wheel at that point where the work contacts the wheel during a normal grinding operation. That point, of course, is the bottommost or lowest point of the wheel, Figure 4. The diamond can be placed directly under the wheel exactly perpendicular to the wheel. However, this tends to wear the diamond flat across the top so that resetting of the diamond is soon required.

It is recommended that the diamond engage the wheel at a 5° to 15° angle. In this way the diamond will be worn at a bevel. Then to present a sharp cutting surface to the wheel, all that is necessary is to turn the diamond in the holder so that the high edge of the bevel encounters the wheel. This principle is similar to the action we all unconsciously engage in when we turn a pencil around while writing to present the sharp edge of the worn lead to the paper.

Obtaining the proper angle of the diamond to the wheel involves no thought on the part of the operator because this angle is designed into many existing holders. Some holders have both vertical and angular receptacles to receive the shaft of the diamond setting.

Safety Factor

It has been the practice with some operators to mount the diamond below the wheel perpendicular to the table at a point about 15° to the left of the center line of the wheel, Figure 4B. However, placement of the diamond directly under the wheel center is strongly urged since accidental lateral movements of the diamond to either right or left decreases pressure on the diamond and eliminates the possibility of gouging the wheel. With the former method if the diamond moves laterally to the right, i.e., toward the center line of the wheel, Figure 4B, pressure would increase along with the possibility of gouging and damage to the wheel.

Figure 4A indicates the direction in which the diamond should be angled with respect to wheel rotation. In this regard it should be noted that some diamond holders have an arrow that indicates the direction in which the holder should be placed on the table with respect to wheel rotation. The arrow should point in the direction of wheel rotation as observed at the bottom of the wheel.

Before actual truing or dressing is begun, the grinder saddle should be so positioned and the wheel adjusted to that height where the cutting edge of the diamond will contact the highest point on the wheel perpihery, as shown in Figure 5. This precaution is necessary to prevent the diamond from taking too deep a cut in the wheel with subsequent damage to the diamond and the wheel. In use, the wheel tends to wear down more rapidly on the area adjacent to the edges, leaving a high ridge in the wheel face. Should the operator begin to true or dress at the most worn part of the wheel face, the diamond will take too great a bite as it moves toward the peak of the ridge.

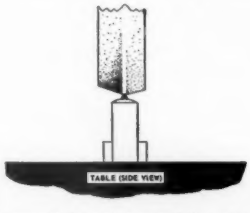
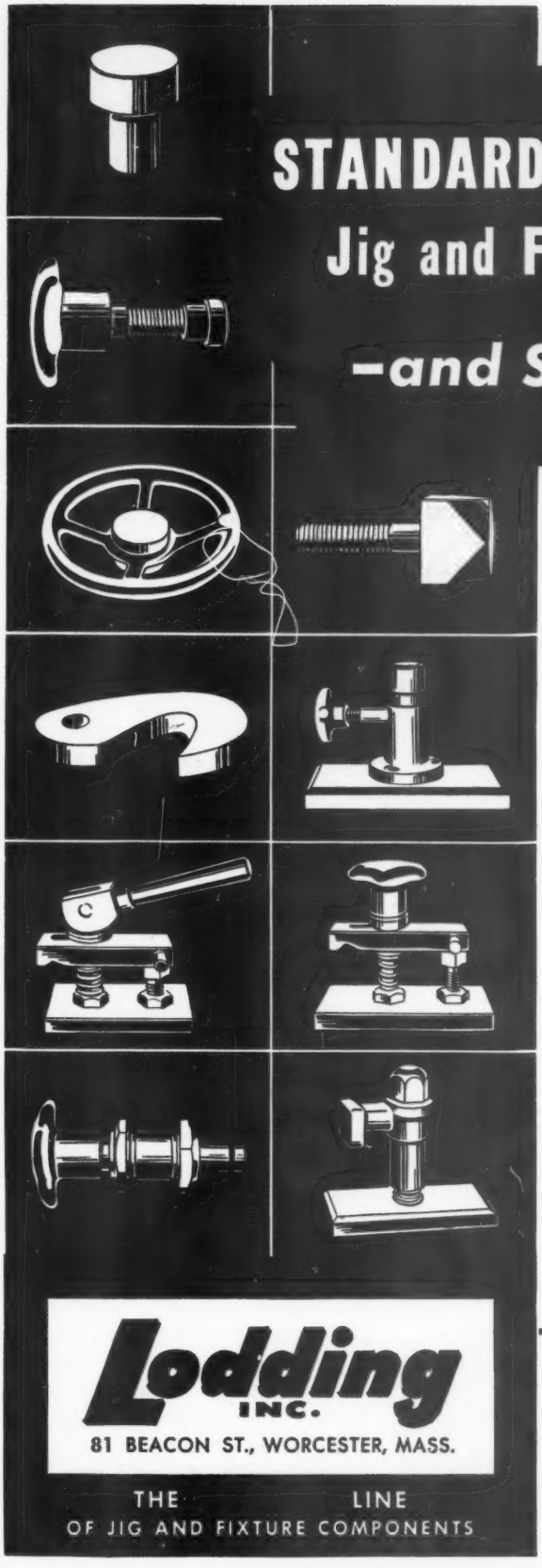


Fig. 5. The diamond should be positioned so that dressing begins at the highest point of the wheel periphery, otherwise too deep a cut will be taken if dressing is begun at the slopes of the ridge.

Truing Speed and Feed

To begin the truing operation, lower the wheel until the high portion (ridge) touches the diamond. Then start the cross feed so that the diamond traverses back and forth across the wheel face. The wheel should be lowered one to two-thousandths per pass for

. . . Continued on page 64



STANDARDIZE with LODDING
Jig and Fixture Components
—and Save Ways!!!

Here's How:

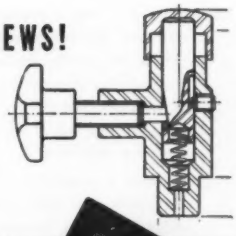
1. Save at Engineering Level!

2. Save Tool Room Labor!

3. Save with Lodding Quality!

LODDING FIXTURE NEWS!

New Lodding Spring Jack records major savings. Ask for design details!



Write for Catalog

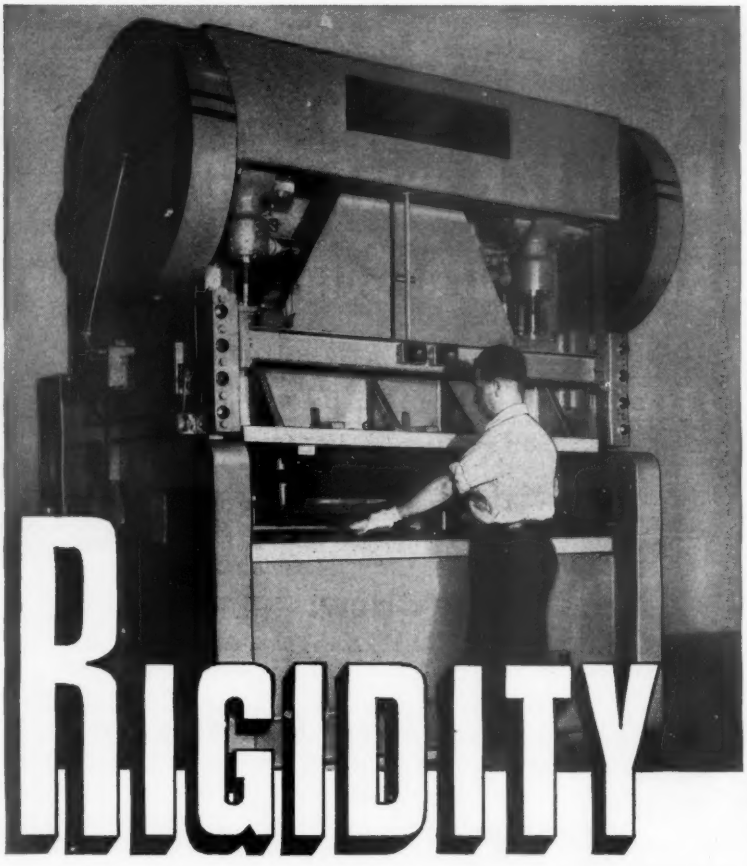
Contains full scale lay-outs of fixture details and clamp assemblies.

Lodding INC.

81 BEACON ST., WORCESTER, MASS.

THE LINE OF JIG AND FIXTURE COMPONENTS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS



RIGIDITY

AND WIDE BED AREA MAKE THE BATH PRESS TYPE BRAKE IDEAL FOR BLANKING... PIERCING... SHALLOW DRAW

THE RIGIDITY of the Bath Press Type Brake is evidence of its high standard of construction. With speeds of 45 or 60 strokes per minute, it has many outstanding advantages such as Overload Protection, Pneumatic Clutch-Brake, End Feeding, Serial Operation etc.

The one piece welded frame, with closed side housings, makes for perfect die alignment, which means stamping, bending etc. to very close measurements. Slide areas are large, about four times those in ordinary bending presses, adequate for most of the difficult blanking, stamping and punching operations. Ram and bed working areas are flush with the forward housing and easily reached by the operator.

Under a heavy production schedule the efficient and economical operation of the Bath Press Type Brake increases production and offsets losses incurred elsewhere.

For further information and specifications on the Bath Press Type Brakes write for this catalog.

THE CYRIL BATH COMPANY

MANUFACTURERS of METAL FORMING MACHINERY

6933 MACHINERY AVE. • CLEVELAND 3, OHIO

. . . Wheel Preparation, from page 62

rough truing and not more than one-half thousandth on the final setting. On a rigidly built and accurate grinder, these increments can be read directly from the wheel calibrations with confidence. Final cuts must be light to minimize pressure against the spindle and the possibility of prohibitive non-concentricity.

In this regard, the importance of having a sharp diamond for truing cannot be over-emphasized. A sharp diamond cuts more readily and thereby subjects the wheel to less pressure, particularly when high or dense spots are encountered. The problem of dense areas in the wheel is one that virtually always present since it is inherent in the wheel manufacturing process. In truing, the dense portion resists the cutting action of the diamond more vigorously than the less dense parts of the wheel. If the diamond were dull, the wheel would tend to ride "up and over" the diamond, thereby springing the spindle and introducing eccentricity in the wheel.

Further, a dull diamond dulls the wheel, particularly in the dense areas, destroying the cutting edges of the hard cutting particles. Thus, the dense areas become high spots which burnish and burn the work, cause cracks and over-all poor finish and appearance.

Cross Feed Speed in Truing

Cross feed speed is determined essentially through experience. However, one general rule can be established and that is, where the wheel structure is coarse with large, widely spaced grains, a faster traverse can be used. For wheels with fine, closely spaced grains a slower traverse is necessary to assure even, smooth truing or dressing. The reason for this lies in the wheel composition. As explained previously, a wheel is composed of

. . . Continued on page 83

Sure signs of precision production

Fine tools are the surest sign of expert craftsmanship in any trade. And, for the machinist, none are finer, more reliable than Brown & Sharpe Machinists' Tools. They command a respect and confidence which are reflected in greater accuracy and increased output of your precision products. They are found wherever precision production is paramount.

The complete line of Machinists' Tools is fully described in the Brown & Sharpe Small Tools Catalog. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Buy through your local Distributor

Brown & Sharpe B·S

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Machining Aluminum, from page 60

tipped milling cutters will usually offer full cutting at the maximum efficient speed of the equipment.

In drilling the high silicon die casting aluminum alloy, considerable difficulty has been experienced in the use of high speed steels both as to drill breakage and drill wear; the latter being the more pronounced. In the specific instance in mind, several through and blind holes were drilled, both in the horizontal and the vertical plane on a specially designed machine. These holes varied from 3/16 to ⅜ inches in diameter and were drilled to a depth of between ½ and ¾ inches. The use of carbide tipped drills of the standard twist drill design has not proved very satisfactory thus far, although we have had drills last for a total of about 25,000 pieces. In general, the drills tipped with carbide experienced breakage before a production run sufficient to offset the cost of the tool had been attained. Carbide tipped drills have not been abandoned since additional work must be done to correct drill breakage.

In our experience, carbide tipped tools have not been used in either reaming, tapping or threading. However, it has been reported that carbide tipped reamers can be employed (2) where the benefits derived justify the additional tool costs. It has been our experience that the high speed steel tools have performed satisfactorily for these operations. However, carbide tipped boring tools have been used with success in the machining of the high silicon aluminum alloys; the front clearance angle being adjusted to the diameter of bore. Thus, in the boring of a hole about ¾ inches in diameter, a generous front clearance angle is required.

The use of carbide tipped circular saws for both hand and power feed is generally accepted. The tooth spacing is generally coarse; usually two or three teeth being engaged in the cut at all times. The alternate set type blade is the preferred (2); the softer alloys requiring appreciably more set than do the harder heat treated alloy types. The speed will usually vary from 10,000 to 15,000 feet per minute, whereas the feed in inches per minute would be dependent upon the alloy content. Thus, a feed from 17 to 24 inches per minute is recommended for the soft alloy types, whereas a feed from 4 to 17 feet per minute is used for the harder type alloys. With hand feed, a cutting angle of 76 to 83 degrees is suggested with a top rake of from one to five degrees. Where power feed is employed, a cutting angle from 71 to 79 degrees is advised while the top rake is increased to 5 to 10 degrees. In both instances, the primary clearance angle should be from 6 to 9 degrees; the secondary clearance angle from 25 to 35 degrees; the side clearance angle from 1 to 2 degrees; and the side rake from 0 to 10 degrees.

A variety of tools that are used for the automatic machining of aluminum alloys can also be tipped with carbide. The most common operations where carbide tipped tools can be employed would include the box tool blades, the box tool vee rests, large counterbores, facing tools, form tools, knee tools, knurl pins and roller supports. Thus, surface finishes of better than 5 micro-inches (3) have been obtained with a box tool, particularly when using roller type rests and tungsten carbide cutting blades. Fine finishes can also be obtained with the v-type rests, with longer life, providing the rests are faced with tungsten carbide.

Of interest is the report made by Kennametal (4) as to the use of carbide tooling in the machining of the cast aluminum nozzle of a vacuum cleaner. As is indicated in Figure 1, the operation consisted of facing both nozzle and edge of bore and forming the indicated 30 degree angle.

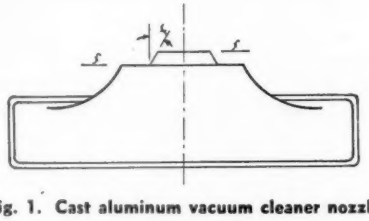


Fig. 1. Cast aluminum vacuum cleaner nozzle.

Previous to the use of carbide tooling, the workpiece was chucked in a No. 4 Universal Warner & Swasey turret lathe and machined in the conventional manner with high speed cutting tools. The turret tools consisted of both the I.D. chamfering and boring tool, and the cross slide held the O.D. chamfering tool and the facing tool. With this tooling, a production of from 300 to 400 pieces per eight hour day was realized.

With the use of carbide cutting tools, production per an eight hour day became 3200 pieces. The operation was done on the same machine, with, however, a special cutter head mounted on the lathe spindle. Kennametal MA8 blades, grade K6, were employed. Two standard milling blades were wedged in position on the cutter head for facing the end of the cast aluminum nozzle. Mounted in the

. . . Continued on page 166

TAKE YOUR CHOICE

We Stock the Best for Every Type of Operation

Ball Bearing **Needle Bearing** **or Tapered Roller Bearing**

LIVE CENTERS

IDEAL *(With exclusive interchangeable inserts)* **LIVE CENTERS**

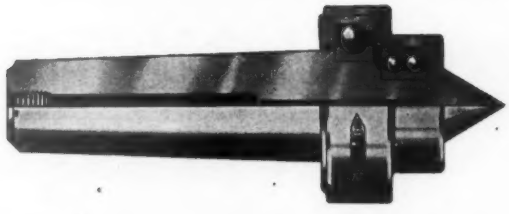
"NIROL" TRADE MARK

Needle Bearing Spring Loading **LIVE CENTERS**

STURDIMATIC

Engineered

LIVE CENTERS



NOW! Have Inefficient, Worn-out LIVE CENTERS Serviced or Rebuilt by OHIO BALL

Complete stock of parts . . . skilled specialists in Live Center maintenance quickly restore worn and inefficient Live Centers to original precision.

Return Your LIVE CENTERS SERVICED or REBUILT in a Matter of Hours . . . Not Weeks.

Ask for Your FREE Copies of "AFBDA Bearing Maintenance Report"

OHIO **BALL BEARING CO.**

Division of BEARING SPECIALISTS, INC.

BALL-ROLLER and THRUST BEARINGS

UTah 1-2828 • 3634 EUCLID AVENUE • CLEVELAND 15, OHIO

ANTI-FRICTION BEARING DISTRIBUTORS ASSOCIATION MEMBER AFBDA

Baumbach Socket Head Cap Screws
Ground Machined Steel Plates and Discs. We furnish plates and discs in any size or shape cut to your requirements in thicknesses from ¼" to 6". We Blanchard Grind up to 84" diameter.
Baumbach Patented Self-Sizing Rite-Fit Dowel Pins.
Baumbach Socket Head Stripper Bolts
Baumbach Socket Head Set Screws
Safety Tongs for handling Die Sets or Plates.
"T" Handle Wrenches for assembling Demountable Leader Pins and Bushings to Die Shoes and Punch Holders.
Specially designed Baumbach Drop Forged Steel Die Shoe Clamps.
Patented Punch Jacks for use in separating Die Sets.

Baumbach Die Set Accessories Immediately Available From Stock

FROM JERGENS

SAVE ON FREIGHT CHARGES—GAIN ON TIME! All Ohio Industry can now enjoy the superiority of Baumbach Die Sets and Baumbach Die Set Accessories with immediate shipment from stock plus substantial savings in freight.

Jergens Tool Specialty Co. now stocks a complete line of Baumbach Die Sets and Accessories to immediately fill your every need.

Baumbach Die Sets and Accessories have long been famous for superior engineering, ruggedness of design, long-life, precision machining, and quality finish. Now they're as close as your telephone or "short-run" trucking service.

Investigate how Jergens "one-stop" service for Baumbach Die Sets—Allen Fasteners and Jergens Jig and Fixture Standards save your time and money.

WRITE TODAY FOR COMPLETE DETAILS ON BAUMBACH LINE

Jergens TOOL SPECIALTY CO.
712 E. 163rd ST. • CLEVELAND 10, OHIO • KENMORE 2015

Wear Resistance and Fabrication

Not too long ago, lengthy production runs in industrial plants were impeded not by the materials used in fabricating the production equipment, but by performance capabilities of the latter. Today the tables are turned. Automaticity, higher speeds and around the clock production runs are putting the pressure on materials. One answer is the use of wear resistant materials on vital equipment components to lengthen production runs and overcome expensive downtime.

The illustration shows one of the die assemblies used for manufacturing silicon carbide and aluminum oxide wheels at the Carborundum Company, Niagara

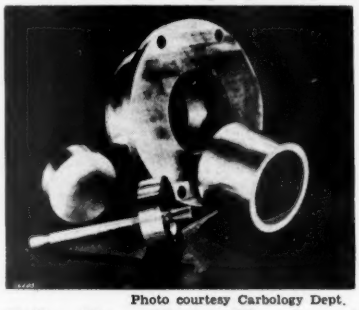
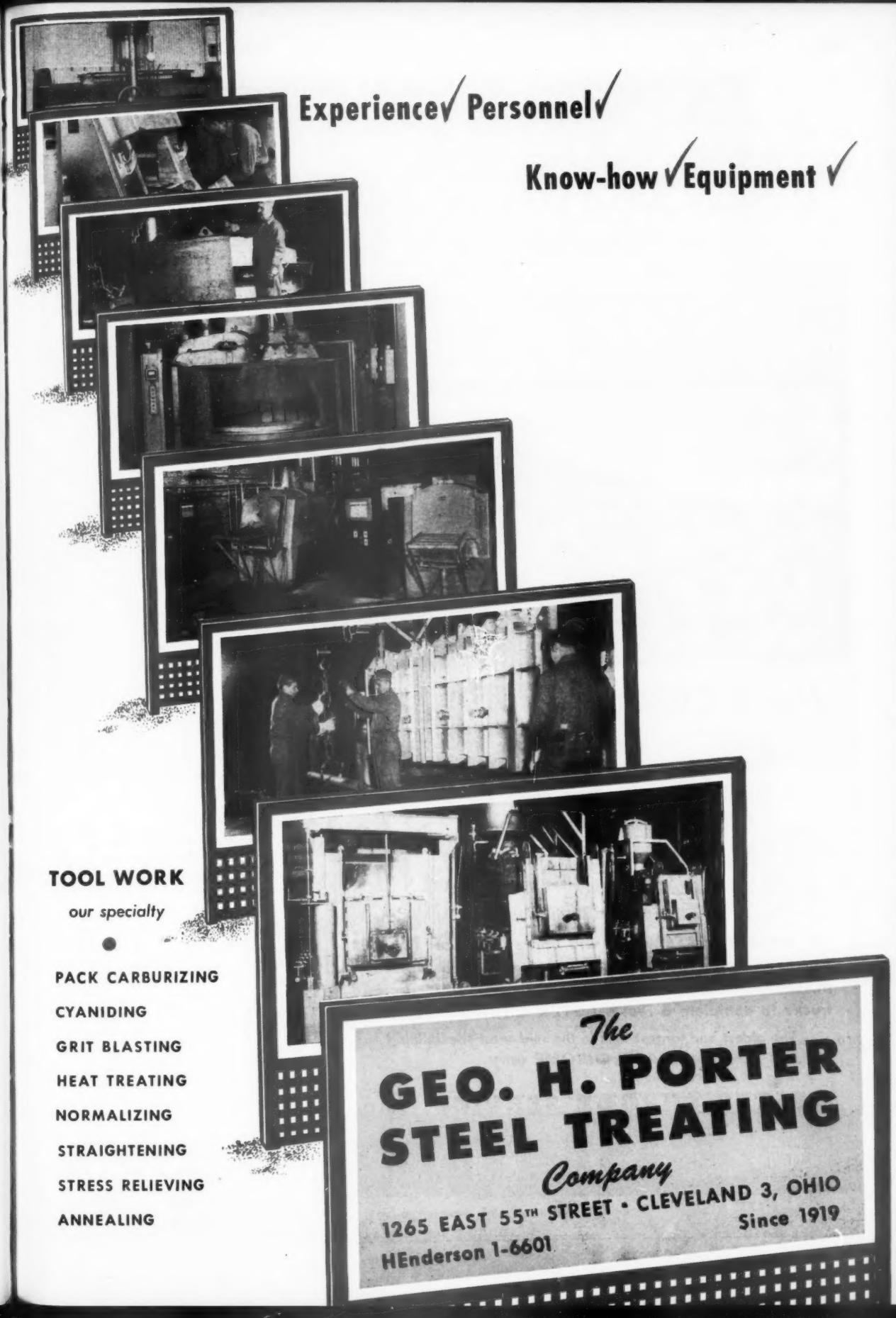


Photo courtesy Carbology Dept.

Falls, New York. The barrel liner, at lower right, is of grade 883 carbide, and the core pin, at lower left, of grade 44A. Both these materials are made by the Carboloy Dept. of G. E. Company, Detroit. The first is a material that provides high wear resistance and is fairly tough. The second is tougher but still has good wear resistance.

At Carborundum Company, these wear resistant inserts are providing an overall average working life about ten times that of other engineering materials. One four inch mold on an automatic press, for instance, produced as many as 86,000 grinding wheels and was still in good condition. The mold employed previously lost its efficiency at 2,500 pieces.

The cost of these tungsten carbide molds, according to Carborundum, averages about three times that of steel. But the cost is more than offset by the wear resistant qualities of the tungsten carbide metal.



Experience✓ Personnel✓

Know-how ✓Equipment ✓

TOOL WORK

our specialty

PACK CARBURIZING
CYANIDING
GRIT BLASTING
HEAT TREATING
NORMALIZING
STRAIGHTENING
STRESS RELIEVING
ANNEALING

The
GEO. H. PORTER STEEL TREATING
Company

1265 EAST 55TH STREET • CLEVELAND 3, OHIO
HEnderson 1-6601
Since 1919

Engineering Management Conference

"How to Administer Engineering Activities" is the theme of the first annual Engineering Management Conference sponsored by the Management Division of the American Society of Mechanical Engineers, to be held at the Rackham Bldg., Detroit, Michigan, April 15-16, 1953.

The program, prepared under the direction of Arthur M. Perrin, Chairman of the Executive Committee of the Management Division and Ercole Rosa, Jr., Secretary, has been carefully developed to give intensive coverage to those problems of engineering administration that are currently plaguing the engineering executive.

The technical program is designed to interest all levels of engineers from those in top management to those who are project leaders and group leaders. The four technical sessions which make up the program will take up such topics for discussion as top-management coordination of engineering departments, facilities for effective engineering, recruiting, placing, and training engineers, and engineering supervision. One paper will present suggestions for the engineer concerned with developing himself for executive responsibilities. Another will discuss the new Bell Laboratories' research and engineering facilities at Murray Hill, N.J. The papers will be preprinted and available before the meeting to provide the opportunity for adequate discussion periods at the end of each of the technical sessions.

Because of the national shortage of engineers the conference takes on added significance for it is planned to present a "how-to" program indicating the way well-respected companies are achieving efficient utilization of their engineering talent.

The Rackham Building is widely recognized for its excellent meeting and banquet facilities. It will provide adequate facilities for the large number of engineering executives who are expected to attend the conference. The registration fee, to cover the cost of preprints, will be $2.50 for members and $5.00 for non-members. The total cost for members, including the papers, two lunches, and the dinner will be $10.50. Arrangements for sleeping accommodations have been made at the Hotel Statler in Detroit.

Carrying out a policy recently adopted by ASME, Frederick S. Blackall, Jr., President of the American Society of Mechanical Engineers, will make one of his few appearances before the local sections when he presents the dinner address on Wednesday evening, April 15, on some phase of engineering management.

Some of the major companies who will be represented by speakers include the General Electric Company; Allis-Chalmers Corporation; Rockwell Manufacturing Company; Westinghouse Electric Corporation; and the Detroit Edison Company.

"Dimonize"
MASTER CHROME
MASTER CHROME, INC.
Hard Chrome Plating . . .
. . . and "Dimonizing"
PICKUP AND DELIVERY IN CUYAHOGA COUNTY
• To reclaim worn dies, tools, gages, etc.
• To salvage mis-machined parts.
• To increase wear-life 3 to 10 times.
• Service Engineers always on call.
• One to a million pieces.
OPEN DAY AND NIGHT
Call
WOodbine 1-2012
*At MASTER CHROME you will find experienced MASTER PLATERS to give you fast service and quick delivery. MASTER CHROME maintains a fleet of service cars and trucks to complete a real MASTER CHROME SERVICE.
The oldest and largest firm in the mid-west specializing on HARD CHROME only.
MASTER CHROME SERVICE, Inc.
MASTER HARD CHROME PLATING
5709 HERMAN AVENUE N. W.
WOodbine 1-2012
Cleveland 2, Ohio

WHEN HEAVY MACHINERY LIKE THIS NEEDS

Rebuilding

Call for a FULTON Representative!

The Cold Header shown in the photograph above is an excellent example of a heavy machine rebuilding job recently completed for one of our customers.

Fulton Foundry's modern, fully equipped machine shop, manned by skilled supervisors and mechanics, is in an excellent position to handle the rebuilding of heavy machinery. Such machines are restored to a "good as new" condition and in many cases give even longer service than the original equipment because of intelligent engineering and the use of superior materials in making replacement parts. When you have a heavy equipment rebuilding problem call for a Fulton representative.

FULTON FOUNDRY & MACHINE CO., INC.

East 75th & Morgan Avenue • Cleveland 27, Ohio • Phone MI 1-8400

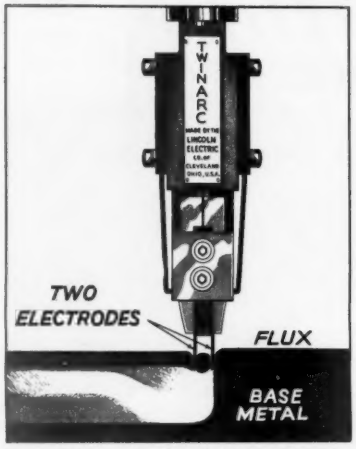
EQUIPPED FOR HEAVY, MEDIUM OR LIGHT JOBBING PRODUCTION

HEAVY JOBBING MACHINE SHOP—METALIZING

MEEHANITE CAST IRON STEEL BRIDGES THE GAP

Twinarc Welding

A new development in the application of hidden arc or submerged arc welding, increases the speed of automatic welding from 50 per cent up. Twinarc welding, as the development is called, employs two small electrodes in place of a single larger electrode. The two electrodes are fed simultaneously through a single head and a single jaw.

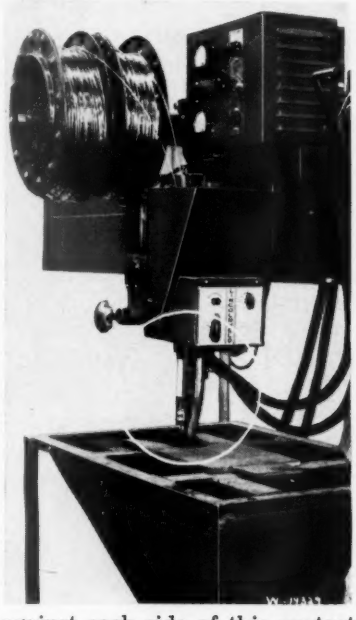


Photos courtesy Lincoln Electric Company

Both electrodes deposit metal in the weld crater. The higher currents possible with two electrodes increase the rate of metal deposition, amount of penetration and, consequently, welding speeds.

Twinarc welding is recommended for use on butt or fillet welds in ¼″ or thicker plate where the application is normal for automatic hidden or submerged arc welding. Typical of the speeds possible is that used in making a ¾″ fillet weld, 15″ per minute at 1500 amperes.

A special electrode jaw, wire feed rolls and wire guides adapt any standard Lincolnweld head for using two electrodes. The standard single head controls are used as well as the standard DC welding current generators. Currents up to 1500 amperes can be used with Twinarc welding for which two generators may be paralleled or a single 1500 ampere unit may be used. The two-wire head will feed electrodes in 5/64″, 3/32″ and ⅛″ diameter sizes. The two electrodes are fed down into the Twinarc jaw where the welding current is conducted into each electrode from the same contact block. The electrodes are pressed



against each side of this contact block which determines the electrode spacing. This spacing is normally ½″ but can be adjusted where necessary. Both electrodes are regulated equally by the common arc voltage control. The welding current from the common welding generator automatically divides between them.

The electrodes are normally in line along the seam but may be skewed ⅛″ so that they are across the seam. This produces a wider bead. If a still wider bead is desired or if burn-through is a problem, the electrodes can be run side by side. Side by side operation is recommended for poor fit-up. These electrode adjustments are the only extra adjustments needed other than those normally required for automatic welding.

In addition to increasing the speed of automatic welding, Twinarc welding also facilitates welding on rusty or dirty plate, producing high quality welds where normal single arc technique would result in pin holes. The two arcs and resulting larger crater allow time for gases in the crater to be expelled.

BAR STOCK HEAT TREATING & STRAIGHTENING
is fast, accurate and meets the most critical specifications

Why wait?—Ship your bar stock to Lakeside for straightening and heat treating. Get a custom job with no delays. Our facilities are ample to handle large tonnages of round, square, flat and hexagon bars.

¼″ to 10″ O.D. and up to 20′ in length are handled quickly and easily. Hardening and drawing furnaces, together with quenching tanks for batch heat treating bars and carbon, alloy and stainless steels. Write or wire for quotation now!

Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting, Laboratory Physical Testing.

THE Lakeside Steel Improvement Co.
3418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100
MTI METAL TREATING INSTITUTE

If you have jobs that you

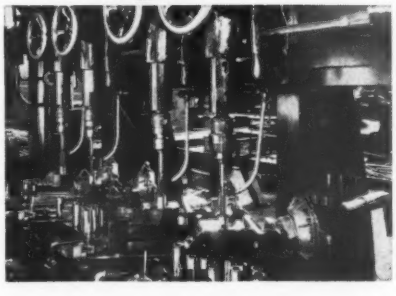
PUSH .... PULL .... or CLAMP..

by hand...you can do it Better and Faster by Air

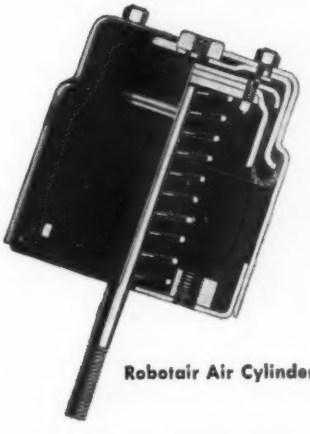
The simple incorporation of Bendix-Westinghouse air cylinders to your machine tools and fixtures will step up your production, increase operator safety and reduce unit costs.

Call a Telco sales engineer today! Let him describe this easy way to increase manufacturing efficiency. A-7111

LOOK TO BENDIX-WESTINGHOUSE ROBOTAIR AIR CYLINDERS FOR ECONOMY, PERFORMANCE, SAFETY



This bank of four Robotair Air Cylinders applied to production tapping operation increased hourly output more than 30% over manually operated vises.



Robotair Air Cylinder

FOR TOOL AND PLANT ENGINEERING NEEDS CALL ENdicott 1-1560

TOOL DIVISION: Drills, Taps, Carbide Tools, Rotary Files, Air Cylinders, Valves and Controls, Machinery and Equipment.

PUMP AND FILTER DIVISION: Pumps, Filters, Electric Switches and Controls, Calibrating Tanks and Separators, Gauges, Thermometers, Compressors, Safety Tools, S. S. or Alloy Tanks and Vessels.

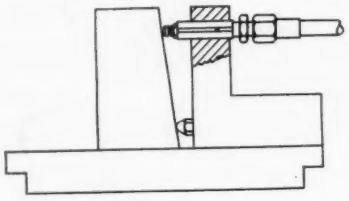
TELCO

TRUMAN E. LONGLEY CO.
4030 SUPERIOR AVENUE
CLEVELAND 3, OHIO

Multi-purpose Gaging Unit Can Be Tailored to a Variety of Jobs

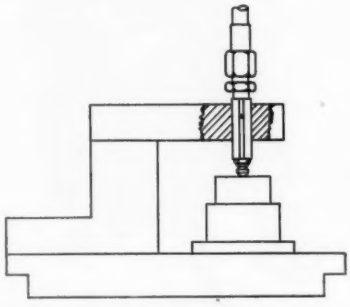
These illustrations suggest the versatility in application of an "air cartridge unit" developed by Pratt & Whitney, Division Niles - Bement - Pond Company, for use in conjunction with their Air-O-Limit gages.

The unit can be used in both single and multiple station fixture-type gages much the same as dial indicators can be used. Practical applications include checking such factors as squareness, height, contour, concentricity, flatness, and depth.



SQUARENESS

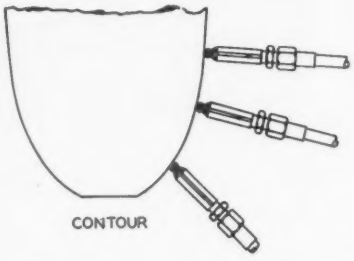
Internal and external average diameters can be checked by using multiple cartridge units in a gaging plug or ring. Many large diameter parts have broad out-of-round tolerances and must be measured for average diameter which can be readily accomplished by using the units in multiple.



HEIGHT

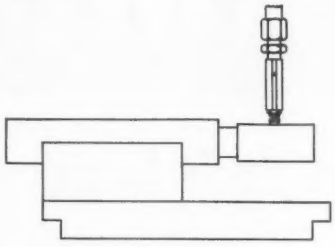
The unit can be applied to machine tools to indicate run-out. As a direct size indicator it will give the operator an indication as the finished dimension is approached.

Height gage applications in connection with surface plates, can be made by mounting the cartridge on a height gage stand and using it in conjunction with a standard P & W Model "F" comparator.



CONTOUR

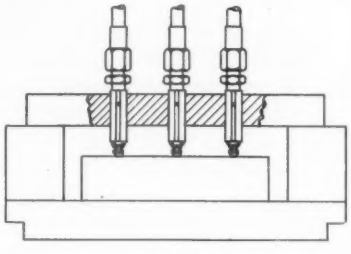
The unit consists of a plunger with a contact point on one end and a stainless steel ball on the other end operating with axial movement in the cartridge body. Air flow through the cartridge unit is restricted by the ball on the plunger operating in a tapered hole in the body, thus



CONCENTRICITY

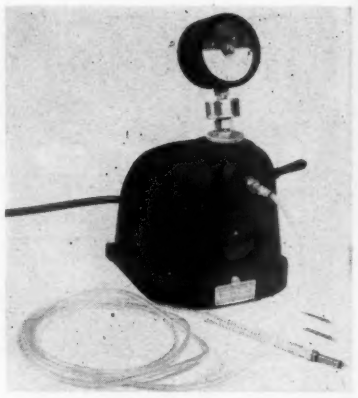
setting up back pressure required to operate the Air-O-Limit gage. A light contact of only three ounces is all that is needed to operate the unit.

The broad scale air cartridge unit, when used with an Air-O-Limit gaging fixture, is correctly calibrated by means of a set of

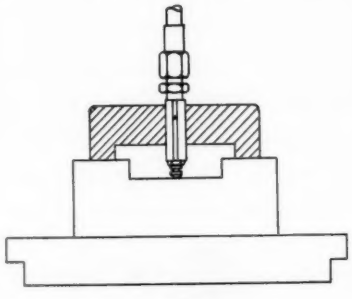


FLATNESS

minimum and maximum feeler gages, thus eliminating the necessity of expensive calibrated masters. Once magnification is established with the feeler gages it may be applied to any fixture and zeroed with a simple setting master or even a measured product.



This Air-O-Limit gage can be equipped with an extension air cartridge unit. The air cartridge units in turn can be incorporated into a great diversity of fixtures to perform a multiplicity of inspections as suggested by the accompanying sketches. The standard air cartridge units, made primarily for wide tolerance work, are available in three magnification ranges operating over total scale readings of 0 to .010", 0 to .015", and 0 to .020". Units can also be furnished having total scale readings ranging from .0006" up to .003". The compact air cartridge unit is only 1¾" long and ⅜" in diameter.



DEPTH

Small and compact, the air cartridge unit measures only 1¾" long and ⅜" diameter. The back of the unit is threaded to fit the standard Natvar tubing for connection to the comparator.

Standard air cartridge units are made primarily for coarse tolerance work and are available in three magnification ranges operating on total scales of .010", .015", and .020". However, units can also be furnished for total scales ranging from .0006" up to .003".

TOOL SHOP SHORT CUT—

A DELTA Drill Press on Every Work Bench Saves Time and Money for BINGHAMTON DIE & MACHINE CO.

DELTA QUALITY MAKES THE DIFFERENCE

"It's much cheaper to install an individual 14" Delta drill press on every diemaker's bench than to move men and machines," says Frank Bowie, owner of this thriving Binghamton, N.Y., shop.

No waiting, no running back and forth — a Delta drill press on every work bench increases Binghamton Die & Machine Co. profits.

Making dies for big shoe factories is his main business, and on most jobs more than half the operations are done on a Delta drill press.

"Accuracy is absolutely essential," says Mr. Bowie, "and we've had remarkable service from our Delta drill presses—for 16 to 18 years, in some cases. At times we use them as arbor presses, and still they stay accurate. They're not babied, either—used night and day in rush periods. Maintenance cost is negligible—no more than $20 per year on all our Delta equipment."

In addition to 18 Delta 14" drill presses, the company has a 17" drill press, three Delta grinders, a 14" bandsaw and a disc grinder.

You, too, can save money with low-cost, high accuracy Delta tools. It costs you so little to have Delta tools throughout your shop—they're ready to use without waiting, eliminate set-up for special jobs, and are easy to relocate at any time.

Do you have up-to-date Delta literature? Send for Catalog AB-52; and call the Delta dealer—listed in the Classified Telephone Directory under "Tools." Write Delta Power Tool Division, Rockwell Manufacturing Company, 622D N. Lexington Ave., Pittsburgh 8, Pa.

Delta drill presses are available in floor and bench models.

DELTA QUALITY POWER TOOLS

Another Product of Rockwell

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Grinding Stresses, from page 57

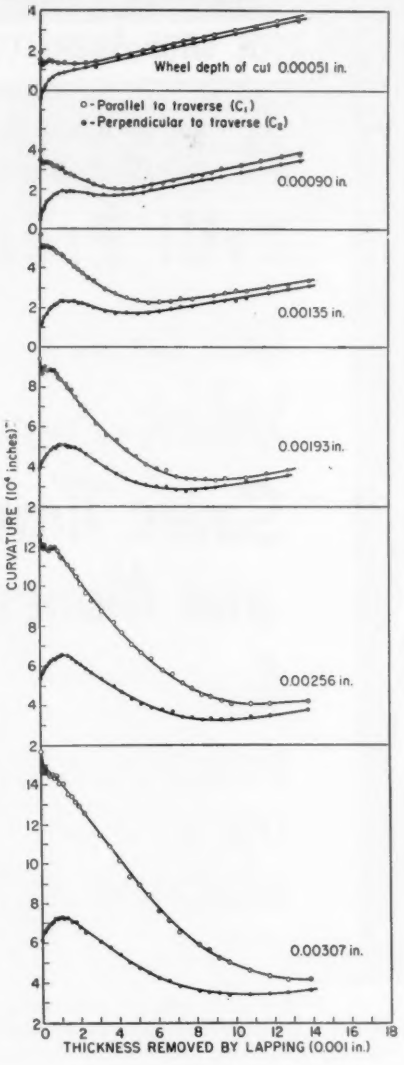


Figure 5

Lapping Test

The lapping test was conducted on a machine (Fig. 2) employing a rotating cast iron lap, onto which was fed 800-grit aluminum oxide abrasive suspended in light mineral oil containing about 10% of lard oil. The 12″ diameter lap was run at 72 rpm. Three identically prepared specimens were lapped simultaneously. Each was placed in a work holder free to rotate. Two of the specimens were lapped with only their own weights supplying the normal force against the lap; an auxiliary weight was added to the third. All of the specimens were given four 10-min. runs followed by one or two 2-hr. runs. Curvature measurements and weight determinations were made at the beginning of the test and after each run.

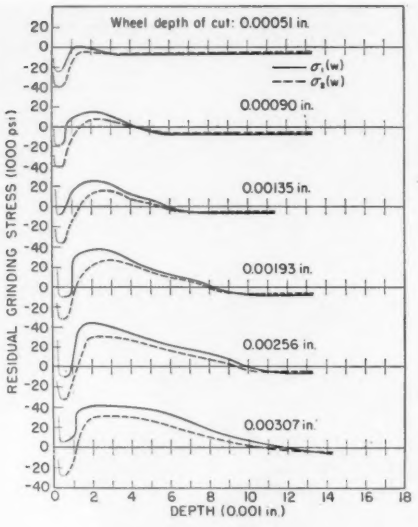


Figure 6

Stress Measurement

Residual stress distributions in the ground and lapped surfaces were determined by removing thin, uniform layers from the surfaces and measuring the equilibrium curvatures of the specimens by optical interferometry. The principal stresses which exist in a layer at any depth before any layers are removed are determined by equation.

The successful application of these equations requires that the removal of surface layers should neither introduce nor relieve any stress in the remaining material other than that occasioned by elastic readjustment to restore equilibrium.

Lapping was used to remove thin uniform layers from the ground surfaces of the specimens studied in the first grinding test. When found impossible to determine stress close to the surface, the test was repeated but with chemical etching. The specimens were immersed in the etchant and swabbed with cotton for more uniform removal. Only the ground surfaces were exposed to the acid, all others having been coated with paraffin wax.

When the surfaces were rubbed lightly on a lap known to be flat within a few wave lengths of light, almost the entire etched area contacted the lap. The total thickness of metal removed in the entire process was determined by micrometer at points near each of the four corners of the specimen. The maximum deviation of a single measurement from the mean of the four on any specimen was 5%. Considering that the specimen had been etched 34 times for a total removal of 0.017″, the uniformity of the etch becomes apparent.

. . . Continued on page 80

KEEPER OF THE KEYS

to your smooth industrial operation...

WHO IS HE?

He is your Industrial Distributor.

He is your nearest, quickest, surest source of supply for countless items you need to keep your plant on the go.

He carries a myriad assortment of tools, machines, parts, accessories and manufacturing staples—in the right types, designs, grades and sizes you require.

He is able to deliver them to you in less time than it would usually take for you to order and obtain them from their original source.

He warehouses huge stocks—many of them items of long-interval demands which otherwise would tie up your own capital (or expose you to the risk of shut-down, interruption or slow-up).

He knows where and how to obtain scarce or sorely needed operating requisites—thus sparing you the time, expense and tedium of searching for them yourself.

He explores the globe for new and improved equipment, appliances and other items that may speed up your production and cut your costs.

He has a reservoir of information about tools and machines from which you can benefit year after year.

As a "clearing house" for all your plant-operating requisites within the foregoing scope, your Industrial Distributor can take over from you a lot of costly bookkeeping—and headaches.

By serving many industrial consumers he also serves many producers, thus reducing *their* "paper work" too... which consequently enables them to pass further savings along to you.

YES, the industrial distributing system has so many advantages to all who use it that it is an indispensable and valuable factor in the economics of free enterprise. Nicholson continues to subscribe to its principles in both words and action.

NICHOLSON FILE COMPANY

PROVIDENCE, R. I. (IN CANADA, PORT HOPE, ONT.)

World's foremost manufacturer of **FILES FOR EVERY PURPOSE**

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

The Army's new 280-mm cannon, capable of firing an atomic shell, roars during its first test (with conventional H.E. shells) at Aberdeen. Production of the carriage assembly for this huge gun is an interesting story, told here in part.

Machine Tools Adapted for Atomic Artillery

An old 19-ft. engine lathe fitted with a specially built traveling-head boring bar helped produce one of the major components in the carriage assembly for the Army's new 280-millimeter gun, which is capable of firing an atomic shell.

Due to urgency of production on the carriages, plus concurrent processing of other high-priority work in Dravo Corporation's machine shop, insufficient time was available on horizontal boring mill equipment for certain operations.

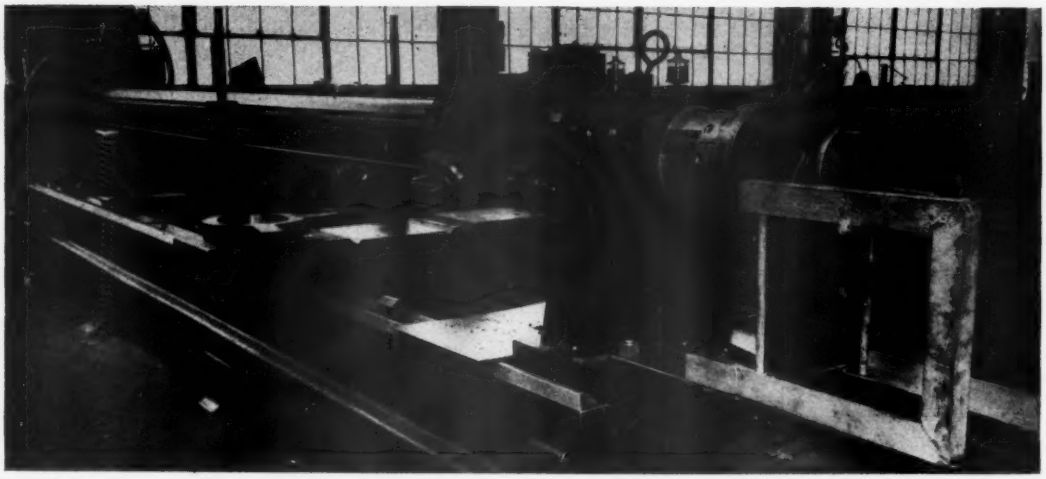
One of these was the preliminary boring of recesses and counterbores for various seals and bronze liners in the cradle tube of the carriage assembly. The cradle tube is the second largest component in the assembly. It consists of a main tube casting to which is welded trunnion forgings, plate reinforcing, and mountings for recoil and buffer cylinders.

Because the preliminary boring is a time-consuming operation, the horizontal boring mill equipment that ordinarily would be used for the work could not be spared. It therefore was decided to utilize the old lathe with a traveling-head boring bar.

The bore, a minimum of 22 in. diameter by 13 ft. long, required a sturdy bar to rough and finish accurately the sand-cast alloy steel casting. Such a bar was made from a 10-in. by 19-ft. hex shaft which was left over from an old paddle-wheel river towboat. A planer was used to take off the square corners of the shaft, and feed screw recesses were cut. A lathe was then employed to finish-turn and polish the bar to 9 7/8-in. diameter.

Steel slab which was readily available was used instead of cast iron to make the split boring head. Bronze was electric welded in the rough bore to form a dam for a poured babbitt bearing surface. The split halves were bolted together and finish bored to bar size. The tool holder was mounted on the boring head and constructed in such a manner that the tool could be advanced by rotating a rod extending the length of the bar. This rod was circumferentially calibrated to enable advancement of the tool by increments of 0.001

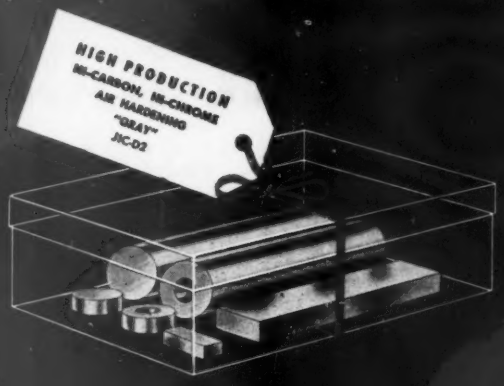
. . . *Continued on page 170*

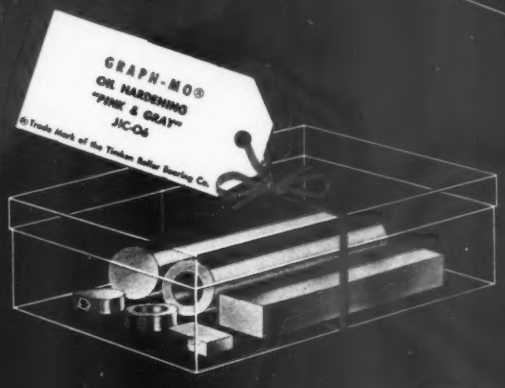


Due to time not being available on horizontal boring mills, converted 19-ft. lathe is fitted with a special traveling-head boring bar to perform preliminary boring operation in the cradle tube assembly of the Army's first "atomic" artillery piece.

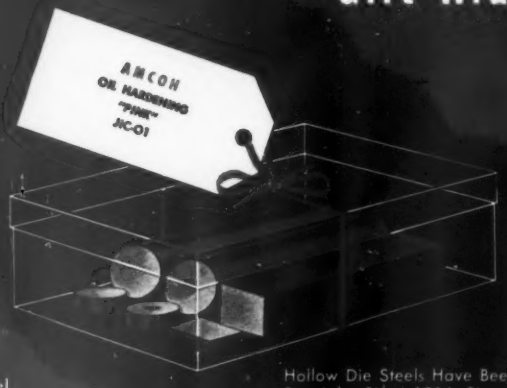
HOLLOW & SOLID

TOOL STEELS . . .





. . . are unforgettably "Gift Wrapped*"



Insulated Against Confusion by Full Length Identifying Kolorkote and Heat Treatment Card of Matching Color

It's just about impossible to lose, confuse or abuse a piece of Milne's Tool Steel. It's completely "gift-wrapped" . . . spray painted in permanent color that instantly identifies the grade. With every shipment goes a heat treatment card of a color that matches the steel.

You eliminate costly errors, delays, confusion and phone calls. Inventory control, scrap identification and stock movements are simplified.

You know what you have . . . how to treat it . . . as long as you have it.

Hollow Die Steels Have Been a Milne Specialty Since 1916. Sizes 16" OD x 12" ID to 2" OD x 1" ID Rough Turned. Smooth Bored.

Write for Milne's New Hollow Die Catalog which includes a section on the new cost-cutting Graphic Hollow Die Steel.

WAREHOUSES
NEW YORK
CHICAGO
BOSTON
NEW BRITAIN, CONN.
PHILADELPHIA
PITTSBURGH
CLEVELAND
DAYTON
SAN FRANCISCO
ATLANTA

SALES OFFICES
DETROIT
ROCHESTER
ST. LOUIS
BRIDGEPORT
LOUISVILLE
WORCESTER
MILWAUKEE

SALES AGENTS
TAYLOR-SPOTSWOOD OF CALIF.
LOS ANGELES
PACIFIC MACHINERY & TOOL STEEL CO.
PORTLAND, OREGON
VINSON SUPPLY CO.
DALLAS, TEXAS
D. A. JACKSON, INC.
SALT LAKE CITY
GEOFFROY-LANE, INC.
DENVER
SANDERSON-NEWBOLD, LTD.
MONTREAL-TORONTO

A. MILNE & CO.
Established 1887
745 WASHINGTON ST., NEW YORK 14, N.Y.
America's Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

Complete line of tool steels . . . Wide range of grades and sizes.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Extensive Stock

OF

KENNAMETAL TOOLS,

BLANKS, and INSERTS

NOW CARRIED BY OUR

DISTRICT WAREHOUSES

AT STRATEGIC POINTS

"ACROSS THE MAP"

CHICAGO
CINCINNATI
CLEVELAND
DALLAS
DETROIT
HOUSTON
LATROBE
LOS ANGELES
PHILADELPHIA
SPRINGFIELD, MASS.

Phone the one nearest you if your need is urgent

This expanded service enables you to quickly realize the plus value of Kennametal tooling — decreased cost — increased productivity. There's a Kennametal tool for your every need.

If you desire help in tooling problems — selection, application, or maintenance — our field engineers are at your service.

Kennametal Inc., Latrobe, Pa.

KENNAMETAL®

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

. . . Month's Talk, from page 40

replace. At other times last minute product changes require welding in the die. Whatever the reason, the job shop should always call the die caster when trouble develops and welding appears imminent. We have found that you can sometimes obtain a deviation from your customer and thus escape welding. If welding is permissible or necessary, a competent welder specializing in atomic welding of alloy steels is consulted and every step is taken to assure a good weld.

Commercial heat treaters do the heat treating for practically all tool shops. We send them accurately machined steel blocks weighing up to 2000 pounds, with very irregular wall sections. They heat these blocks to 1750 degrees F., cool in still air, then draw at 1100 degrees F. All we request is that the proper hardness be achieved and that the cavity remain smooth and clean and straight within a couple of thousandths. As you know, that is where trouble can develop.

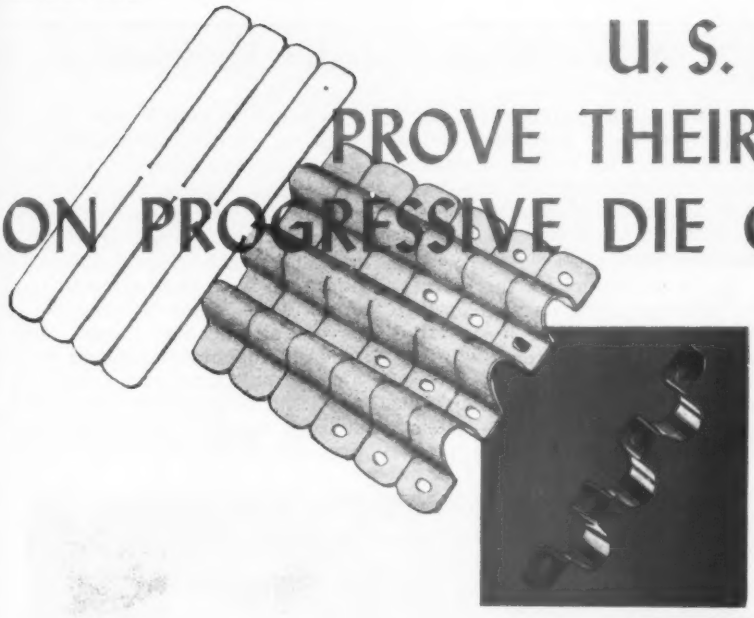
Some of you purchase your dies soft, shoot samples and then complete the hardening and refitting in your own toolroom. Other die casters prefer to purchase a die with hardening and refitting included in the quoted price by the job shop.

The most important requirement of the job shop in building die casting dies is the development of an excellent organization of men. The finest supervision and the best toolmakers are essential to give you the high quality die which you deserve. The job shop will work to mold its working force into a smoothly operating unit with a character directed to serving you—the customer.

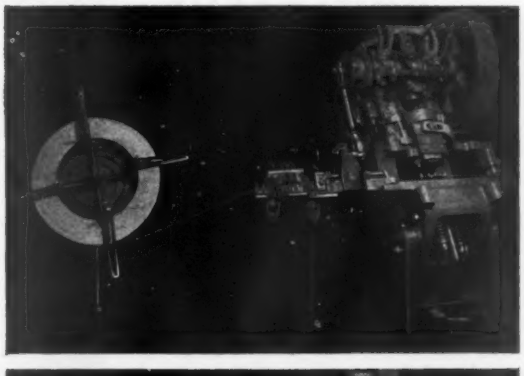
Fine equipment will enable skilled men to give an outstanding performance; however, that same equipment will not turn

. . . Continued on page 166

U. S. SLIDE FEEDS PROVE THEIR ACCURACY ON PROGRESSIVE DIE OPERATIONS



The photos directly below illustrate the use of U. S. Slide Feeds equipped with U. S. Plain Straighteners on standard type open-back presses. This setup converts the press into an automatic machine; all the operator has to do is to start a new coil of material into the die after the previous coil has been run off. To make the setup complete U. S. Stock Reels are employed in both instances for holding the coils of material.



Closely controlled accuracy with U. S. Slide Feeds —not just a statement, but a proven fact, as illustrated by the progressive die job being run by Judson & Rose, Inc., 3112 North 17th Street, Philadelphia 32, Pennsylvania.

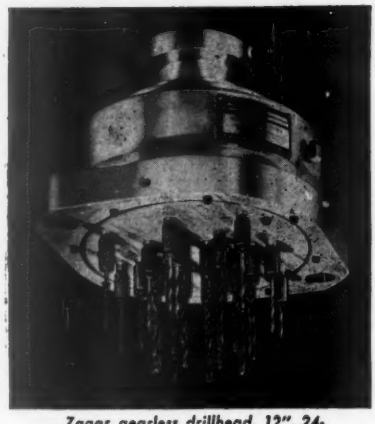
The sketch directly above shows the progressive die operations, and the finished piece is shown actual size at the left. ***On this job there are no stops or pilots in the die. Accuracy of feed length is controlled by the U. S. Slide Feed to closer than .001".*** This example of U. S. Slide Feed accuracy is not exceptional. It is typical of results which are being obtained by other users of U. S. Slide Feeds.

If you have a press job which demands an accurate feed, we suggest that you investigate U. S. Slide Feeds. They are made in a range of sizes to accommodate stock up to 20" in width and with feed length adjustable up to a maximum of 20". Bulletin No. 80-T contains complete specifications of U. S. Stock Straighteners, U. S. Stock Reels and U. S. Coil Cradles. Ask for a copy.

U S PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY



Zagar gearless drillhead, 12", 24-spindle; capacity up to 5/8" steel.

Zagar
GEARLESS
DRILLHEADS
excel for drilling
on close centers

Their unique features have earned for Zagar gearless drillheads a permanent place in many industries. Examples: gds burners, acoustical tile, parts for aircraft (jet engines), business machines, electrical appliances, automotive and farm machinery; drilling cast iron, stainless steel, paper, fiber glass, magnesium, aluminum, brass and copper.

Why this versatility? Because Zagar gearless drillheads (1) can drill practically any number of holes at one pass, up to 600 or more; (2) can drill any material; (3) can drill in any pattern; (4) can "come down to" distances between holes as small as twice the drill diameter; (5) can and do maintain accurate spacing. High production thus combines with complete accuracy to deliver more work and more acceptable work in less time than ever before. Zagar gearless drillheads can be furnished as complete units or can be adapted to any standard drill press. Your parts drawings and full data will bring you a prompt quotation.

Write for Engineering Manual "T-4" for more information on Zagar's tools for industry.

ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

A New Single Spindle Automatic

A new single spindle bar machine has been specifically designed to fulfill the requirements of master mechanics, production superintendents, and operators. It is designated as the manufacturer's Model 126.

It is at home in the turret lathe department as well as the screw machine line. It has the speed for aluminum and the strength for high temperature alloys. It is a big machine, taking up little floor space—a production machine equally efficient on short runs. To initiate the design of such a new machine to fill these requirements (and many more), the company's engineers established for themselves the following project pattern: quicker setup; simpler camming; low cost; wide range of feeds; easily varied, wide range of spindle speeds; large work area; rigid construction; adequate power for carbides; chucking designed for hot rolled stock; ample chip clearance; large coolant capacity; simplicity, safety, and economy of operation; small floor area; and use of standard attachments.

The net result of working to this project pattern is the completely new, Model 126—a machine designed for the operator; a machine so simple that a man with no previous automatic experience can become a setup man in one week; a machine which can be changed from one average job to another in 1 ¾ hours; a machine which is sold equipped with the four standard cross slide cams necessary to cover all desired cross slide feeds; a machine equipped with a universal turret cam providing an infinite variation in feed strokes up to 6 ¾ inches and preselection of 10 automatically changed turret feeds; a machine offering stepless spindle speed variation from 80 to 1500 r.p.m.; a machine without feed change gears; a machine providing extreme flexibility without electronics; a machine with complete programming of functions; a machine designed for the use of water-base coolants; all in the floor area required for the average-size office desk.

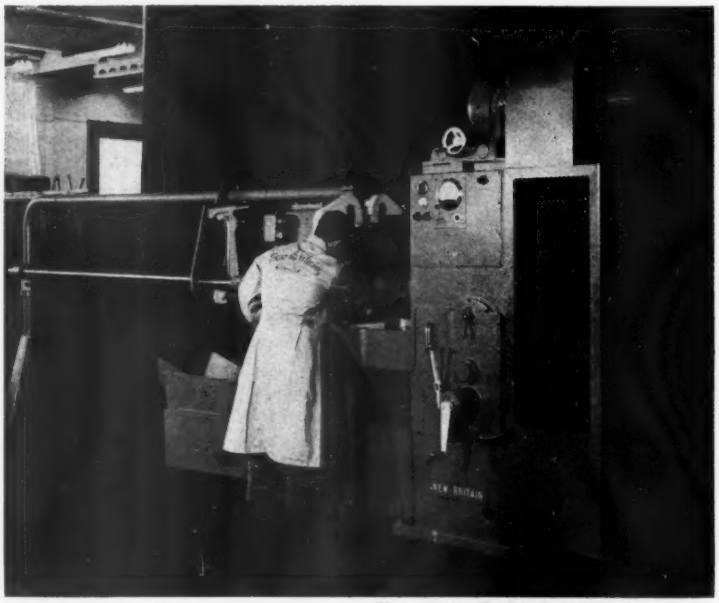


Photo courtesy The New Britain Machine Company

The most important of these advantages are the result of three special features of the machine: program drum, automatic transmission with universal turret cam, and standard cross slide wedge cams actuated by the turret motion.

. . . *Continued on page 78*

Savings reported by users of LINCOLN PARK CARBIDE GAGES

CARBIDE SLICES INITIAL GAGE COSTS OVER $6,500.00 ANNUALLY

AN EASTERN manufacturer of ground glass products found replacement costs of worn steel gages to be excessive—gages were expended at a rate of 2,500 per year. At $3.50 per gage his annual cost for steel gages was $8,750.00.

Carbide gages were applied to this inspection operation and lasted at least 25 times longer than previous steel gages. After making a complete switch to carbide only 100 gages at $22.00 each were purchased per year. Thus, carbide gages cost only $2,200.00 annually and this manufacturer saved $6,550.00 each and every year on gage replacement costs alone.

For further information on how to reduce inspection costs with carbide gages, send for booklet . . . "If steel gages were FREE !"

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE LINCOLN PARK 25, MICH.

MANUFACTURERS OF:
CARBIDE, CHROME PLATED, AND STEEL GAGES — CARBIDE ROTARY FILES. ALSO, FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

BARNES HACK SAWS — BAND SAWS BARNES

BARNES ROCKET

POWER and HAND HACK SAWS ARE IN DEMAND FOR PRODUCTION CUTTING

GRADIENT HARDNESS

1. HIGH SPEED STEEL
2. FLEXIBLE—TOUGH
3. SAFE—SHATTER-PROOF
4. MEETS EVERY SHOP TEST
5. FOR ALL-PURPOSE CUTTING

Distributors want repeat sales and continuing profits. Barnes Rocket assures Distributors these advantages because the Rocket has proven to be safe and more dependable. You can be sure of repeat sales.

Call YOUR INDUSTRIAL DISTRIBUTOR

BARNES

W. O. BARNES CO., INC.

1287 TERMINAL AVE., DETROIT 12, MICH.

Power Brushing Diamond Wheels Increases Cutting Action 80 Percent

A new brushing method that increases the cutting action of used diamond wheels by 80 per cent is now in use at the S. K. Wellman Company, Cleveland, Ohio.

This method, worked out by Wellman Engineers in collaboration with the Osborn Manufacturing Company, utilizes a wire brush to remove some of the brass matrix, leaving the industrial diamonds sticking up for better cutting action, thus giving each wheel added life.

The new method takes on added importance in view of the present government diamond allocation program. Since there are not enough diamonds available to fill present demand, it is of utmost importance that each diamond wheel be used in the most efficient manner to obtain maximum output; and that the wheels be made to last as long as possible.

Fig. 1. Diamond wheels are used at Wellman for cutting grooves in silicon alloy material used for clutch plates. They are used in various sizes such as shown here; 3 inch ⅛ and ¼ thick, 8 inch ½ and ¼ thick. The diamonds are bonded in brass matrix.

The diamond wheels are used at Wellman to cut grooves in silicon alloy material used for Wellman "Velvetouch" clutch plates. Various sizes are used: 3 inch diameter, ⅛ and ¼ inch thick; and 8 inch diameter, ⅛ and ¼ inch thick. The outer rim is a bond, ⅛ or ¼ inch in thickness, of industrial diamonds

. . . Continued on page 84

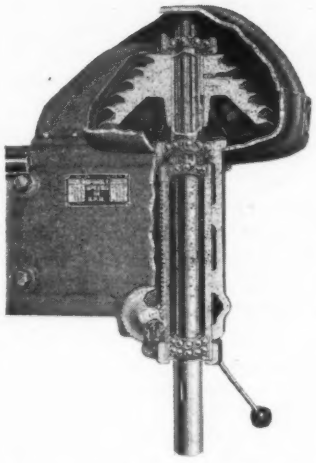
FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

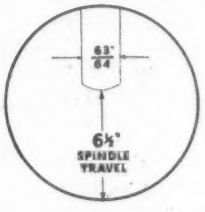
Power, Precision, Capacity

For Accurate **HEAVY-DUTY** Drilling!

CLAUSING

18″ HEAVY-DUTY DRILL PRESS





The spindle is special tough precision-ground steel, 63/64″ in diameter. Bore is No. 3 Morse Taper. Spindle travel is 6½″. The larger spindle provides larger tool capacity—the longer travel gives MORE JOB capacity and greater efficiency on production operations using quick-release chucks.

You can move BOTH the head and table with the Clausing positioning mechanism—an exclusive feature that reduces set-up time to a minimum.

Vernier depth stop with graduated dial and easy to read scale provides depth control accurate to .001″—a Clausing exclusive that improves accuracy, saves set-up time and effort.

Construction of head, spindle, quill, and bearings of the Clausing 18″ drill press assure precision work and lasting accuracy. Quill guides, drive bearing housing, and column bearings are line bored. Spindle is 63/64″ precision-ground steel. Quill is also precision-ground steel, 2⅛″ in diameter with 5/16″ thick walls. Spindle turns on precision-type ball bearings spaced 8½″ apart. Upper bearing is sealed for life. Note the special double-row, double-shielded lower bearing—BOTH races of lower bearing absorb drill and radial thrust. Bore is No. 3 Morse Taper. The Clausing is the only 18″ drill providing all these features for greater tool and job capacity.

Production oil table is big and rugged—a 95-pound casting with 13″ x 18″ precision-ground surface! Has two 17/32″ T-slots spaced 10″ apart. Alternate choice of precision-ground 12″ x 14″ full-tilting table.

Column is 3½″ diameter centerless-ground tube steel 72″ long for accurate alignment of head, table, and base.

Base has 12″ x 14″ ground working surface for accurate handling of large stock. Has 17/32″ T-slots, and 18″ throat capacity. A solid, massive foundation for the entire drill press.

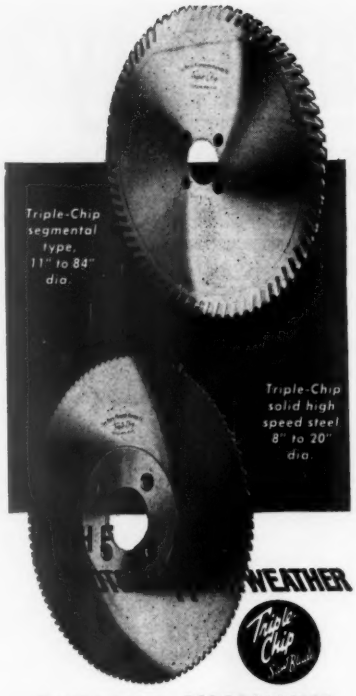
The Clausing 18″ drill press is built especially for heavy-duty work—with heavier head, table, column and base—big precision ball bearings—greater tool and job capacity for drilling up to 1″ in cast iron, ¾″ in steel—plus many exclusive features to improve accuracy, save time. Put the Clausing to work in tool room, research lab, or 'round-the-clock production—you'll get greater production and accuracy with the smoothest, easiest operation you've ever seen. Send for the Clausing catalog.

CLAUSING DIVISION

ATLAS PRESS COMPANY

4-115 N. PITCHER STREET • KALAMAZOO, MICH.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS



GIVES YOU *EXCLUSIVE* ADVANTAGES IN CUTTING OFF STOCK FAST AND *ACCURATELY*

Fast, burrless cut-off of shapes and tubes up to 30" round. Let M & M Triple-Chip saw blades give you the higher *production-with-accuracy* which Industry must attain and maintain. Ask your dealer.

INVESTIGATE, TOO, THIS VALUABLE AID TO PRODUCTION

DISTINCT ADVANTAGES

For the most favorable results, time- and profit-wise, use Motch and Merryweather's superb coolant. Anti-weld averting pickup. Sharper tools and longer-lived. Oily, but not "greasy". Smokeless, odorless. A real aid to money-making production.

* * *

THE MOTCH & MERRYWEATHER MACHINERY CO.
715 PENTON BUILDING
CLEVELAND 13, OHIO

Triple-Chip METHOD

REMEMBER — IT'S THE COST PER CUT THAT COUNTS!

Only M & M builds ALL 3:

. . . Automatic Spindle, from page 74

Program Drum

The program drum is the nerve center or "brain" of the Model 126. It is from this central control station that the operations of cutting off, unchucking, stock feeding stroke are governed. Preset strip cams and five limit switches (incidentally, the only limit switches on the machine) positively time all these movements in proper and accurate sequence. The drum is divided into five sections, one for each side of the turret, and bears a scale on each feed section reading directly in inches of turret stroke.

Also mounted on the drum are five shifter arms which, during the high-speed cycle, automatically preselect any one of 10 feeds for each of the five turret stations. This automatic choice of feeds is made possible by the automatic transmission.

The program drum, then, permits the operator to set his high speed and low speed cycles quickly and easily, choose the exact length of feed stroke, and preselect the feeds for each of the turret stations without changing feed gears.

Automatic Transmission, Universal Turret Cam

The five shifter arms on the program drum preselect any one of 10 possible different turret feed gear ratios in the automatic transmission. This preselected gear ratio rotates the main turret cam drum at a specific speed and imparts a certain feed per revolution to the turret. The faster the drum rotates, the coarser the feed of the turret. The slower the drum rotates, the finer the feed. This automatic transmission has two ranges of five feeds each in steps from .003 to .060 inches—an ample range for any job.

No matter what the setup, the operator never has to change cams or gears to get his turret feed. The easily positioned shifters on the program drum do it all.

Cross Slide Camming

Cross slide cams are sine bars or wedges mounted on the front of the turret. When the turret feeds forward, the wedges are moved ahead under the spherical rollers on the ends of the cross slide arms. As the rollers ride up the cams, the cross slides feed in.

With such a combination of motions, it can easily be seen that figuring cross slide feeds and cams is simply a ratio of turret feed to cross slide feed. Cams are made in four standard ratios or sizes: 1/10, 2/10, 3/10, and 4/10.

Simple arithmetic is all the operator needs to use to select the proper cross slide cam when he knows the turret feed. With a turret feed of .012-inch, he will get .0012-inch feed per revolution on his cross slide with a 1/10 cam, .0024-inch with a 2/10 cam, .0036-inch with a 3/10 cam, and .0048-inch with a 4/10 cam. If he should require any feed in between these standard ratios he can increase or decrease the cam angle with adjusting screws. Figuring cross slide feed in ratio with any other turret feed is just as easy.

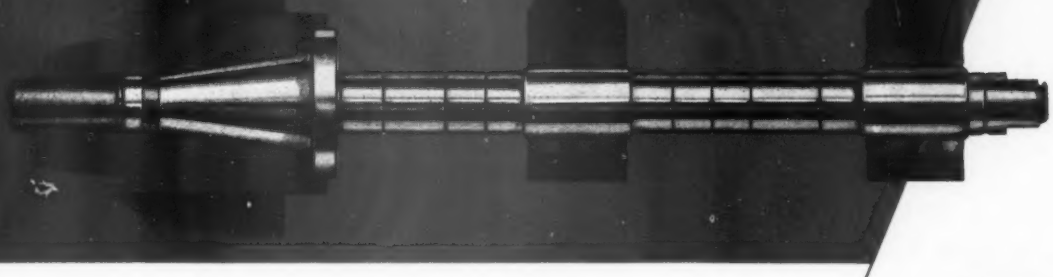
To make this simple cross slide cam setting job even more simple, a cam setting gage is supplied with the machine so the operator can preset his cams for the next job on the bench.

Every turret station has a mounting for front and rear cross slide cams and, therefore, independent forming can be done in either position.

These main advantages thus provide not only a new, simple approach to camming, but simplify the actual procedure of tool setting. In actual setup, there are no turret cams to change, no cross slide cams to make, and no feed gears to change. The cross slide cams are chosen by ratio, in relation to the turret feed. The turret feed is obtained from the universal turret cam by simply changing the position of the shifter arm on the program drum to give, through the automatic transmission, the desired feed on the turret. The turret feed stroke is varied as desired by locating the brake cam on the program drum to establish the length of turret feed stroke required by the respective operations in each respective turret station—thus infinite flexibility.

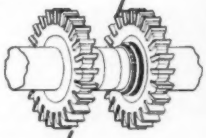
FOR FAST, ACCURATE, LOW-COST MILLING MACHINE OPERATIONS

use S-J ARBORS and ADAPTERS



Make heavy or light cuts fast and accurate with S-J rugged precision built Arbors. Arbor and pilot diameters held to plus .0000", minus .0005". Arbors filled with spacers and sleeves which have faces ground parallel within .0002"—makes cutters run true and take an even distribution of cutting load. Taper shanks are checked on light gauges to guarantee a perfect fit in spindles and minimize run-out.

Low-cost milling machine operations are assured when using S-J Arbors. Built from forgings, they are tough and withstand the punishment required of today's production. Mass produced, they meet the test of low-cost tooling—quality at low cost that can't be beat.

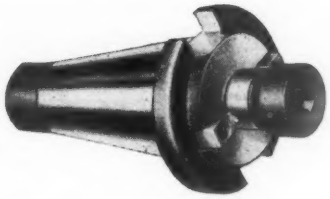


TIME-SAVING S-J ADJUSTABLE SPACING COLLARS

Save valuable time in making accurate adjustments between cutters on gang or straddle milling, and on multiple slotting set-ups.

HIGH PRECISION S-J SOLID SPACING COLLARS

Help assure true-running cutters. Carefully heat treated and faces ground parallel within .0002".



LARGE SELECTION S-J ADAPTERS

Style "C", Shell End Mill Arbor, shown here, is only one of the various S-J Adapters that enables you to convert spindles for driving a variety of tools, such as: end mills, facing mills, keyway cutters.

Write for Revised Bulletin No. 2-50 showing complete line of S-J Arbors, Collars and Adapters.

Scully-Jones AND COMPANY

1913 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

R-5275

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Grinding Stresses, from page 68

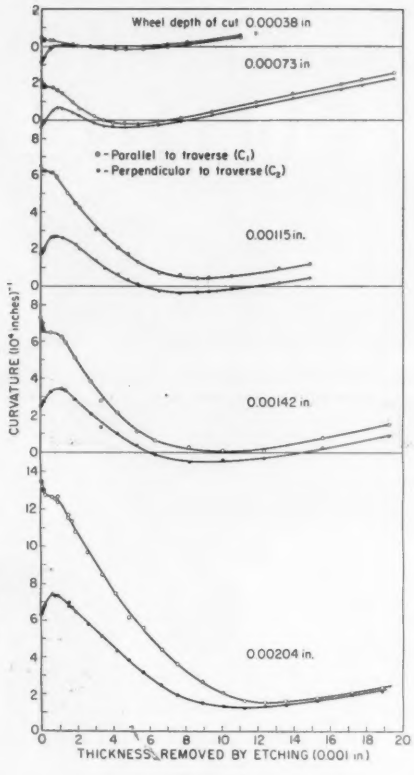


Figure 7

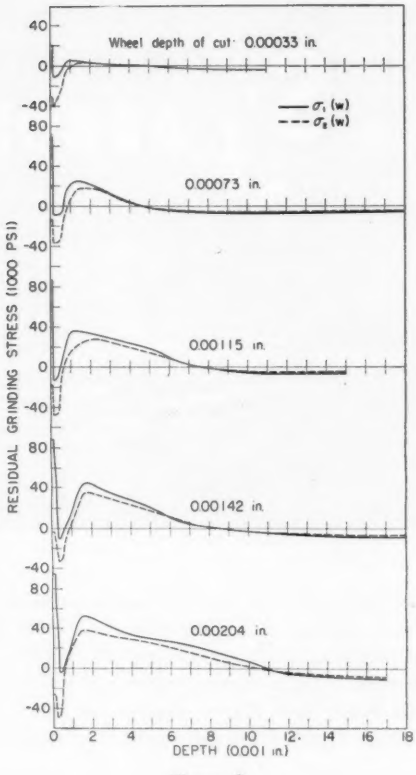


Figure 8

The effect of the lapping and etching techniques upon three specimens identical to those employed in the first grinding test and the lapping test was determined by etching the test surfaces twice in 5% nital, lapping three times at a normal pressure of 0.65 psi, and again etching four times in 5% nital. An upward trend of the curvature values is due to a small residual compressive stress, characteristic of the heat treatment given the specimens. If compressive stresses of the type described by Lihl were introduced by the etching, they had no significant effect upon the curvature measurements in this work.

Results of Grinding Tests

Inspection of the interference patterns formed between reference surfaces of the ground specimens and the optical flat revealed that the stress induced in the grinding tests was at least biaxial, with principal stresses oriented parallel and perpendicular to the traverse direction. See Figure 3. The maximum bending occurs along the minor axis of the elliptical fringes, and the minimum bending along the major axis; consequently, these are the directions of the principal stresses.

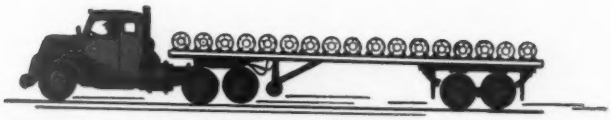
The effect of depth of cut upon the curvatures of the specimens after the grinding tests is shown in Figure 4. The trend of the curvatures toward negative values as the mean depth of cut decreases implies a transition from nominal tension to nominal compression at very small depths of cut.

The curvature parallel to traverse was always algebraically greater than that at right angles for any given specimen. Within the range investigated, the algebraic difference increased with increasing depth of cut.

The differences in slopes of corresponding curves are well outside the limits of error in the curvature measurements and must be attributed to differences in the residual surface stresses. This is most likely to be due to the cutting condition of the wheel or to the residual thermal stresses present in the specimens before grinding, although other factors are involved.

Although sectioning by lapping can cause a major error in stress determinations very near the surface, the error diminishes rapidly with successive removals. Assuming that all the grinding stress in this layer is removed by lapping, Figure 5 can be corrected by disregarding all experimental points up to a depth of 0.0002" and shifting remaining points

. . . Continued on page 85



OUNCES OF WESSONMETAL CEMENTED CARBIDE!

TONS OF PRODUCTION!

ACTUAL JOB

Farm Implement Mfg. Co.

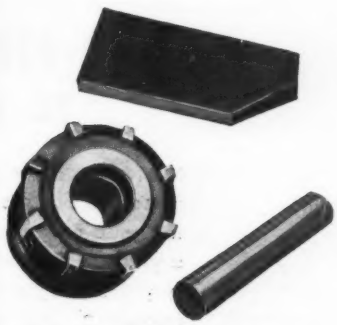
Machine.....Ingersoll Boring Mill—6 spindle
Part.....Cylinder block
Operation.....Rough cylinder bore
Tools.....3 R.H. and 3 L.H. Wesson Fine Pitch Cutters—3.480 dia.—12 Wessonmetal Solid GI Blades
Speed.....148 S.F.M.
Stock Removel...3/16"
Feed.....10" per min.—.063 per revolution
Length of Cut....8⅞"

OVER 300% DOLLAR SAVINGS PER TOOL

OLD METHOD		NEW WESSON METHOD	
Pieces per Grind	836	Pieces per Grind	3160
Cost of Tool	$49.68	Cost of Tool	$172.80
Grinding Cost per sharpening	$11.70	Grinding Cost per Sharpening	$8.78
Tool Cost per 100 Pieces	$2.588	Tool Cost per 100 Pieces	$0.642

On only one machine with Wesson Tools Savings of over $900 per year

HOW IS YOUR PRODUCTION SCORE CARD!



Write today for folder on Wesson's educational, full color, sound movie—"This Carbide Age."

WESSONMETAL Cemented Carbide

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY
Affiliated with WESSON COMPANY, Detroit, Mich.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

BARTH EXPANDS* AGAIN!

THE BETTER TO SERVE YOU!

SO MUCH NEW EQUIPMENT has been added to Barth's facilities since moving into our new plant on Brookpark Road a year and a half ago, that we are literally "bursting at the seams" . . . therefore, additional manufacturing space is being added, thus expanding our operations to provide the facilities listed herewith.

Why not have a Barth representative discuss your special machinery, tooling or stampings problem with you? He may be able to point out a way of doing it faster, better and at lower cost.

BARTH EXPANDED FACILITIES *provide:*

- 350 Foot Long High-Bay Area.
- 55 Foot Truck-Trailer Drive-In.
- 2 Ten Ton Heavy Duty Overhead Cranes.
- 1000 Ton Double Action Press for testing large dies & having the following capacity:
  - 84" F to B — 51" Shut Height
  - 126" R to L — 22" Stroke
- 500 Ton Single Action Press with comparable capacity to the 1000 Ton Double Action Press.

BARTH

STAMPING & MACHINE WORKS, Inc.

12650 Brookpark Road, Cleveland 29, Ohio

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

. . . Wheel Preparation, from page 64

hard crystals bonded together with a friable material. Hardness of the crystals approaches that of the diamonds and contrary to somewhat popular belief, the crystals are not fractured by the diamond to any degree but are literally knocked out of the wheel.

Actually, the diamond shears the bonding material away, loosening the cutting crystals which either fall out or are knocked out. The wheel is properly "flat trued" when all the outermost cutting edges of a new layer of crystals are exactly on the same plane. Consequently, for a wheel with finer crystals the diamond must travel more slowly to make certain that every grain in the wheel face is subjected to the leveling action of the diamond. Control of cross feed is greatly simplified in some grinders and particularly

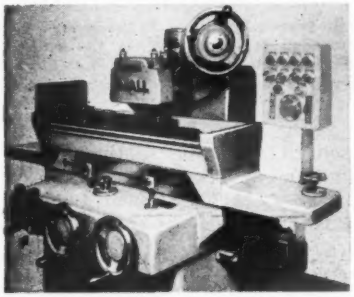


Fig. 6. A typical DoAll precision surface grinder. Arrow lower left indicates cross feed speed control—a grinder innovation.

in the DoALL grinders, Figure 6, which now incorporate an infinitely variable "wheel dressing speed control".

Assuring Full Concentricity

From a practical standpoint, there is only one way of assuring full concentricity and that is through proper and careful truing. In summary, this requires:

(1) A rugged grinder—accurately aligned, rigid spindle

(2) A sharp diamond

(3) Proper placement of diamond

. . . Continued on page 90

DELTA MILWAUKEE QUALITY MAKES THE DIFFERENCE

NOW! 3 Models of

DELTA Drill Units

AIR POWERED—HYDRAULIC CONTROL

A practical, low-cost way to solve machining problems involving drilling, tapping, reaming, spot facing, hollow milling, chamfering, centering, counter-sinking and the like—Use the Delta Drill Unit to devise special tool set-ups that multiply production, break bottle-necks.

Rarely has a new machine achieved success so completely and so quickly as this new Delta air-powered hydraulically controlled Drill Unit.

Thousands of manufacturers, on the alert for ways to get better production faster and at least cost, have won astonishing benefits by means of this adaptable unit—by designing special machines for multiple and series operations.

You'll appreciate "Why" when you check these 12 reasons:

1. Quick set-up. No cams used.
2. Rapid approach and return.
3. Length of approach and total stroke positively controlled.
4. Approach repeats to within .010 inch—final depth to within .0005 inch.
5. Power feed hydraulically controlled . . . Independent of motor and spindle speed.
6. Compressed air provides the force on a sealed, pumpless hydraulic system to move spindle forward, completely eliminating lost motion and back lash.
7. Sealed unit construction permits operation in any position.
8. Built-in control switches.
9. Units offered as direct drive, gear drive, or pulley drive.
10. Standard NEMA frame motors.
11. Utter simplicity of operating principle and rugged design insure long, trouble-free service.
12. Operates efficiently at standard plant 80 p.s.i. air pressures.

Three models are now available to meet your specific requirements:

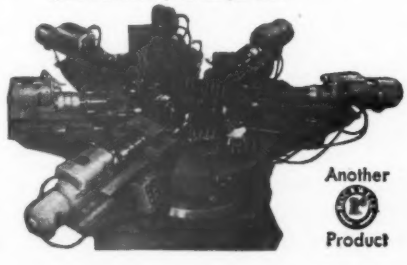
MODEL 19-150—1½" stroke. Capacity from No. 80 to 1/16" drill. 4 types of drives.

MODEL 19-400—4" stroke. Approximate capacity up to 3/8" drill. 5 types of drives.

MODEL 19-600—6" stroke. Approximate capacity 1" drill. 6 types of drives.

See your authorized Delta drill unit dealer —write for the new catalog.

Eight station, semi-automatic drilling machine built for Badger Meter Mfg. Co. of Milwaukee. This machine drills, counter-sinks and counterbores over 230 parts per hour. Machine has six working stations, a total of 22 spindles producing 5,000 individual operations per hour.



Another Product

DELTA POWER TOOL DIVISION

ROCKWELL MANUFACTURING COMPANY

622D N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me catalog AD-723.

☐ Send name of nearest authorized Delta drill unit dealer.

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

D & J PRESS CO. LINES THEIR BALING PRESSES WITH SPEED TREAT STEEL PLATE TO STAND THE GAFF!

D & J Press Co., Inc., Buffalo, N. Y., builds scrap baling presses large enough to take an automobile and compress it into a bale 2' x 2' x 5', weighing about 1-ton. The charging box is 6' wide, 5' deep, 14' long. Compression, from one end and one side, is furnished by two 14", 2,000 lb. cylinders and two 17", 2,000 lb. cylinders. Construction is welded heavy boiler plate. Charging box and platens are lined with ¾" SPEED TREAT (X1545) open hearth, medium carbon steel plate — selected because it is so easy to machine (in this case, drilling holes), and because it ably resists abrasion and impact. In this application the SPEED TREAT plate has a tendency to work-harden and resists gouging.

SPEED TREAT Steel, one of the Speed Steels, has remarkable physical properties — speeds machining, increases tool life, readily polishes to a high lustre, suited to flame or induction hardening and other treatment — widely used for machine parts, hardened gears and sprockets, rubber molds, short run blanking dies, etc. Consult your nearest distributor.

SPEED STEELS

W. J. HOLLIDAY & CO.

SPEED ALLOY • SPEED CASE • SPEED TREAT

DISTRIBUTED BY

Brown-Wales Co., Cambridge-Hartford-Auburn, - Bridgeport Steel Co., Milford, Conn. Beals, McCarthy & Rogers, Buffalo, N. Y. - Burger Iron Co., Akron, Ohio - Grammer, Dempsey & Hudson, Inc., Newark, N. J. - Earle M. Jorgensen Co., Los Angeles-Houston-Oakland-Dallas - Passaic County Steel Service, Inc., Paterson, N. J. - Peckover's Ltd., Montreal-Toronto - Peninsular Steel Co., Detroit, Mich. - Pidgeon-Thomas Iron Co., Memphis, Tenn. - Horace T. Potts Co., Philadelphia-Baltimore-York, Pa.

Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

. . . Power Brushing, from page 76

in a brass matrix.

In service, the wheels wear down to a crown shape and must be squared up, or "trued and dressed." "Truing" is the process of restoring the cutting face of a wheel to running truth. "Dressing" is done for the purpose of improving the wheels cutting action. Dressing the wheel is primarily a cleaning or "resharpening" operation by removing any load, or minute amount of bond between the diamond particles. This job is done by the Osborn wire wheel brushes.

Fig. 2. Truing the wheel is a process of restoring the wheel to running truth. Two wheels are trued at the same time, pancaked together. When the parting line between the two wheels is no longer visible, the truing operation is complete.

In "truing" or squaring up the diamond wheels, a brake controlled truing device is used. Two wheels are "trued" at the

. . . *Continued on page 86*

Fig. 3. The wheels are dressed by Osborn brushes. The brushes remove some of the brass matrix leaving the diamonds sticking up for better cutting action.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

. . . Grinding Stresses, from page 80

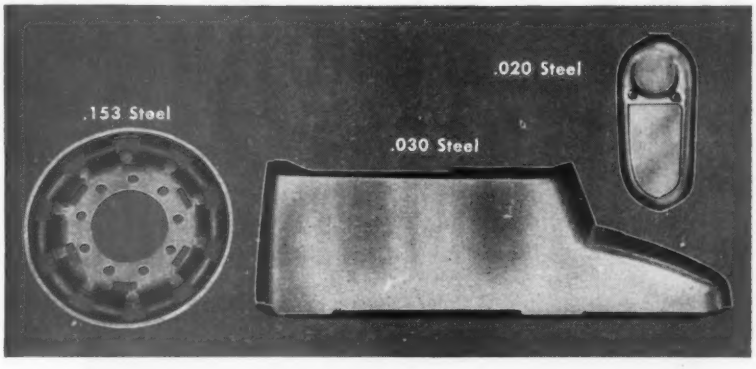
to correspond to 0.0003″ greater depths. When this is done, the stress distributions in Figure 6 can be obtained by equation. This correction is probably more than ample, since 0.0003″ is the maximum depth of stress penetration observed in any lapping test and since the grinding stresses may not be completely obliterated to the maximum depth by the plastic deformation of lapping.

Sectioning of the stressed layers of the five specimens in the second grinding test by etching yielded the curvature-versus-depth curves in Figure 7. The curves resemble those of Figure 5, but they differ in two respects. First, the slopes obtained by etching are much smaller than those obtained by lapping for depths up to 0.0002″; consequently, the stresses calculated from Figure 7 are much more reasonable than those calculated from Figure 5 in this region. Second, comparison of the slopes of the final straight-line portions of the curves in Figures 5 and 7 indicates that the specimens in the second test had slightly different initial thermal stresses than those in the first. This is perhaps due to the difference in stress relieving procedures. Stress distributions for the second test are shown in Figure 8. Comparison with Figure 6 reveals the close agreement between the stress distributions obtained by the two methods of sectioning.

This study, together with those of Martindale and Henriksen, shows that the unidirectional cutting or abrading of ferrous materials results in a residual biaxial stress distribution in which the net force parallel to the direction of abrasive travel is always algebraically greater than the net force of right angles to the direction of travel. This can only mean that

. . . Continued on page 122

one press stroke -no more!



TRIMS SHELLS COMPLETE

Assures Clean, Flat Edges

Slow, costly, multiple "horn" operations, and distorted edges due to "pinch" trimming can be eliminated by a Brehm Die. Operating on principles different than ordinary trimming methods, the Brehm "Shimmy" Die with angular cams causes the shearing edges to cut *four ways* in a *single* press stroke.

Materials, thickness, shapes and sizes look alike to a Brehm "Shimmy" Die. Whether it's stainless or mild steel, copper, brass, zinc, gold, fiber, silver, aluminum, rubber or plastic, Brehm users are assured of precise production results. Shapes can vary widely, whether a watch case, artillery case, refrigerator door, automotive or aircraft part. Clean, flat, burr free edges are assured. Edge contours can be straight or curved, with multiple notches and projections.

When model changes alter the part design, or if you wish to handle an entirely new part, you only need to substitute cutting adapters.

Write today . . . for a free catalog. Find out what a Brehm "Shimmy" Die can do—submit blueprints, or the part for full information or quotation.

THE "SHIMMY" REG. DIE ® Brehm TRIMMING DIES

THE STEEL PRODUCTS ENGINEERING CO.

BREHM DIE DIV., DEPT. 10 SPRINGFIELD, OHIO

MAIL TODAY!

HAVE YOU READ THIS NEW FREE BOOK?

American Photocopy Equipment Co.
2840 North Clark Street, Chicago 14, Ill.
Please rush me, without obligation, your factual report on office copying. I understand this free booklet pictures and tells the complete Auto-Stat story and shows how I can use Apeco Auto-Stat in my office.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

DRY PHOTOCOPIES AUTOMATICALLY!

ALL ELECTRIC!

APECO Systematic Auto-Stat

EXPOSE!

PROCESS!

COPIES PEEL APART!

ONE UNIT DOES IT ALL!

Makes photo-exact copies direct from original letters, forms, bids, contracts, invoices, catalog sheets, reports, blueprints.

Yes—now a dry photocopy from any original in less than 45 seconds without any additional equipment. The Apeco Systematic Auto-Stat prints, processes and dries automatically . . . copies are ready for instant use. It saves up to 80% on copying jobs. Eliminates costly re-typing, hand copying, checking or expensive outside copying service. It's fast—only 2 steps will make legally accepted prints from any original up to 11x17 inches—printed on one or two sides.

SO LOW COST

A complete Apeco Systematic Auto-Stat installation is priced well within the budget of even the smallest firms. Remarkably low operation cost, too!

Manufactured in the U.S.A. by
AMERICAN PHOTOCOPY EQUIPMENT COMPANY

. . . Power Brushing, from page 84

same time. They are pancaked together in a Delta Toolmaker, and while the diamond wheels rotate, the truing wheel is passed back and forth across their faces.

Fig. 4. Before and after the wheels are trued and dressed. The wheels on the left, because of their condition, are of very little use any more. Their cutting action is increased by 80% after grinding and brushing.

As long as 30 minutes of grinding is done, with approximately 1/32 of the diamond wheel taken off, depending on the amount of "truing" necessary.

When the surfaces of both diamond wheels are uniform and there is no visible parting line between the two wheels, the operator estimates that the wheels are squared up.

"Dressing" the wheels is done by an 8 inch Osborn wire brush. Both the brush and the diamond wheels rotate at 3600 revolutions per minute. The object here is to remove some of the brass matrix, leaving the diamonds sticking up for better cutting action.

Industry News

J. J. Demuth, engineering consultant for Ehrhardt Tool & Machine Company, St. Louis, has been named consultant to the Tool, Die, Jig and Fixture Section, Metalworking Equipment Division, National Production Authority, Washington.

Mr. Demuth was recently given a testimonial award by the National Tool & Die Manufacturers Association for his previous service as Chief of this important section of NPA.

BEST GRIP in the BUSINESS-

Sutton Collets and feeders!

COLLETS FOR ALL TYPES OF MACHINES

Sutton Collets satisfy thousands of users because they run true and they hold true! The famous "Diamond Grip" serrations, exclusive in Sutton collets, attack horizontal and rotating thrusts at an angle—work is gripped tighter, spoilage is reduced, life of chucking mechanism is prolonged under a reduced tension, and the collet is self-cleaned of scale, chips and dirt.

Uniform Temper and Tension

Equally important is Sutton's modern and exclusive heat treat method, which localizes controlled heat to give uniform spring temper on all collets and uniform tension on all feeders. This uniformity of temper and tension provides added useful life to the collet and feeder, thus saving greatly on down-time.

Write for Catalog 18

26 pages complete with valuable collet and feeder information and specifications. Sent Free!

All Popular Sizes Carried in Stock For Immediate Delivery!

SUTTON COLLETS

FEEDERS and TOOLS

Sutton Tool Co., Dept. TP-4, Sturgis, Mich.

Suttons Run as True as the Spindle

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Weldments, from page 49

shell is welded to a bracket which is subsequently bolted to the turret whose axis is then parallel to that of the shell. At the top of each head assembly is a flange that supports the hydraulic cylinder with its piston and end fittings which is a purchased Electrol unit.

The lower end fitting of this cylinder makes a very close fit with the piston rod. It contains an annulus connected by a drain tube that carries any oil seepage back inside the turret. Below the annulus is a "Garlock Klozure". This leak-proof construction keeps any hydraulic fluid from seeping down onto the can caps.

Head construction is such that as the split chuck at its lower end moves down, the cap and can are retracted inside the chuck, compressing a spring plunger until, after the two can parts are ground into line, enough pressure is applied to force the cap over the can. When the cap is in place, the split chuck is unlocked and is retracted on the up stroke of the piston in the hydraulic cylinder, thus freeing the can for removal by a star wheel.

Valves that control the hydraulic motion are mounted on top of the turret and revolve with it, their operating rollers remaining in contact with a fixed cam near the top of the column. The latter extends down to the fixed table and serves a vertical pivot or quill about which the turret, supported in ball bearings, turns. Actually the column is a weldment, since annular plates are welded to its ends. Hydraulic fluid that drains back into the turret passes into the column tube, and at its lower end is drawn off through an elbow and flows back to the reservoir for recirculation.

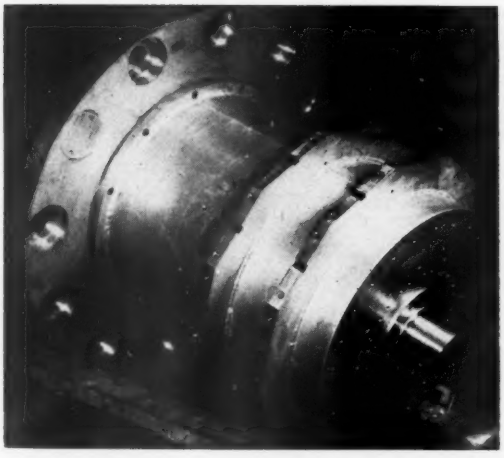


Fig. 6. Turret weldment as it appears from the top end and with its lower flange bolted to a table recessed to receive twelve permanent magnets which hold cans while they are capped.

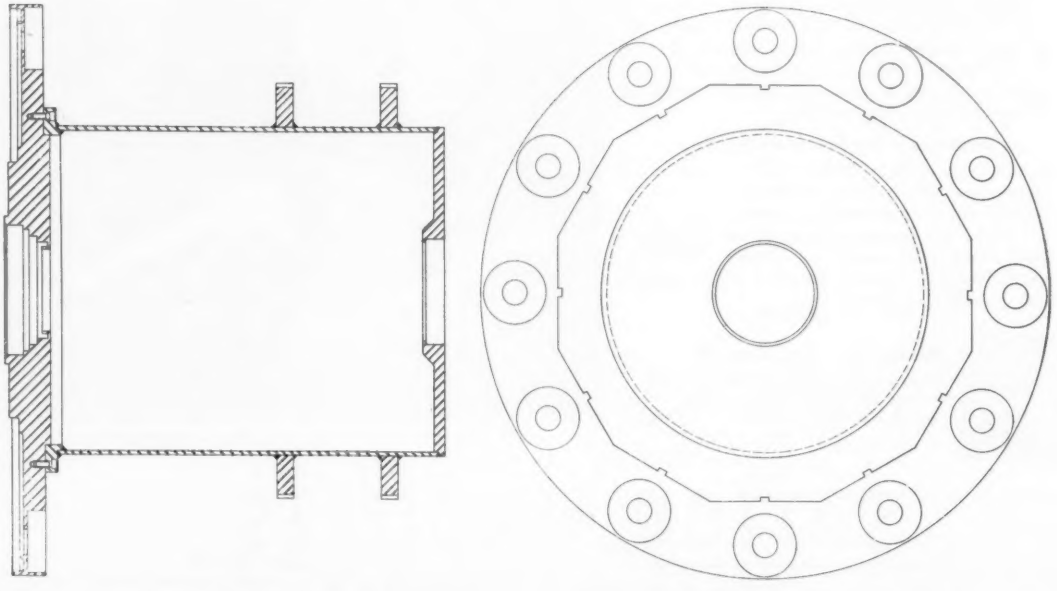


Fig. 5. Turret assembly shown partly in section. Its cylindrical shell is rolled from ¼" plate, butt welded at the longitudinal joint and subsequently arc welded to a head and flange and to two twelve-sided rings that support the capping heads.

A turret cover is provided to hide the turret and the parts it supports and to give the top portion of the machine its clean "streamlined" appearance. This cover is a weldment made in sections, with liberal radii and joins the flat top with the cylindrical portion at the place where the step in the bottom of the cylindrical portion turns down.

There are also liberal radii between the top of the weldment called the table shroud, and its vertical walls as well as where the

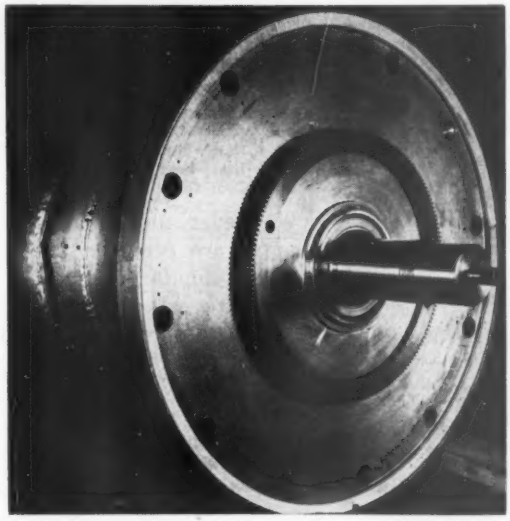


Fig. 7. Underside of the turret table assembly after the column and ring gear are in place, and the lower ball bearing has been inserted in its central recess. The small central tube is part of the line that conveys hydraulic fluid to the head operating cylinders.

latter join at vertical corners. Neither the turret cover nor the shroud is an unusual weldment except that both are made from steel which is ⅛" thick. Rounded edges, however, do improve the appearance and promote ease in cleaning.

Besides the weldments already mentioned, there are others that need not be described in detail. They perform their share in completing the assembly. Although it can be said that the arc welds are not especially noteworthy in themselves, they do contribute greatly to convenience in construction. In fact, the arc welds are so useful from a structural standpoint that, if they were not available, important changes in overall design would have to be made. Moreover, it is certain that if arc welding was not used costs would go up and substitute methods of joining might be less satisfactory.

NEW ALPHA 100 TON DIE TRYOUT PRESS

YOU CAN [illegible] fit and finish both [illegible] punch WITHOUT REMOVING the DIE. "Tryouts" take less time because the press is open on all four sides, giving easy access to the die and punch. The head can be quickly released and rotated to any point up to 240°. This new press is compact, being 82" high and occupying only 75" x 84" of floor space. The rugged construction of the Alpha 100-ton die tryout press assures years of trouble-free service.

The top die in position for altering.

It's easy to work on the bottom die.

Send today for your free folder. It gives all the details about this remarkable press.

ALPHA TOOL WORKS
9281 Freeland Ave.
Detroit 28, Mich.

. . . Wheel Preparation, from page 83

(4) Strict observance of truing recommendations

(5) Use of coolant

When the final setting has been made for the last truing cut, the diamond should be passed repeatedly across the wheel face until the diamond ceases entirely to remove material. An indication that this condition has been reached is obtained by observation of wheel sparking or by holding the hand to the left of the wheel (if wheel revolves in clockwise direction). If wheel particles are felt to strike the hand, continue passing the diamond. During these final passes of the diamond, it should be observed that the diamond is cutting evenly—not sporadically. The stream of particles against the hand should be constant rather than intermittent. This constancy is an indication that the wheel is concentric and therefore the diamond is cutting evenly around the wheel periphery.

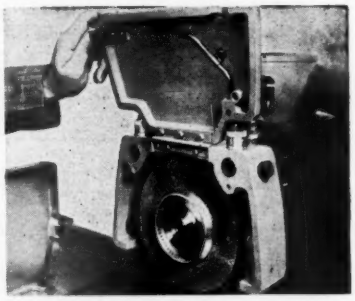


Fig. 7. Wheel guard with cover raised showing perforated flange on grinding wheel. Coolant enters wheel through such a flange on each side and flows through the wheel to point of cut. This is the "Cool Grinding" process.

Whenever the wheel and its adapter are removed from the grinder spindle and then replaced, the wheel should again be trued to eliminate any possibility of non-concentricity.

Coolant

It is urged that coolant be used while truing and dressing to protect the wheel and diamond from excessive heat. The higher the temperature of the diamond, the more quickly it is worn down. Furthermore, this heat is transmitted to the setting and holder causing them to expand erratically thereby introducing irregularity into the wheel shape.

Certain grinders, such as the DoALL grinder, have the "Cool Grinding" feature where the coolant passes directly through the wheel to point of cut, Figure 7. This is ideal since each grain of the wheel is assured of a supply of coolant even when under pressure from the diamond. Where "Cool Grinding" is not available, flood grinding will be adequate, provided the coolant is directed at the point of contact between the diamond and the wheel.

Wheel Dress

After a wheel has been properly "flat trued" it may or may

We're Enthusiastic Over Ease of Set-up and Accuracy of DICKERMAN ROL-DI-FEEDS

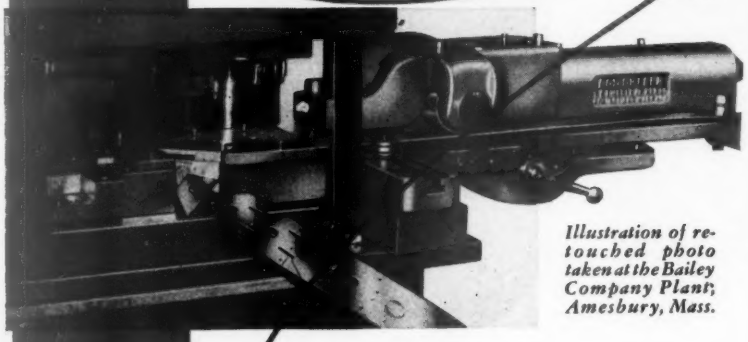


Illustration of retouched photo taken at the Bailey Company Plant, Amesbury, Mass.

As a result of their initial experience, when The Bailey Company, Amesbury, Mass., decided to equip the balance of their presses, Rol-Di-Feeds were selected.

States MR. H. W. POTTLE, *Chief Engineer*, "We are completely satisfied with the Dickerman Rol-Di-Feeds we have in service, as proven by our repeat orders. Our die setters who constantly use this equipment comment enthusiastically on its ease of set-up and accuracy."

Whether your operation is blanking, or producing parts from a compound or multi-station progressive die, the Rol-Di-Feed will do the job, reduce your costs and increase your production.

Write Dept. D for full information and a new photograph showing variety of work fed with this Rol-Di-Feed . . . . .

H. E. DICKERMAN MFG. CO.
323 Albany Street • Springfield, Mass.

not have the desired "dress". If the wheel is to be dressed for removal of material at a moderate rate and a fine finish is also desired, its face should be as even and flat as possible. This may have been accomplished in the truing process, but in general, a wheel should be purposely dressed for the finish desired.

Sometimes, however, the wheel will be heavily "loaded", i.e., glutted with chips from a previous grinding operation. If insufficient wheel material was removed in the truing operation, some of this loading may remain in the trued wheel. The loading, of course, diminishes the cutting efficiency of the wheel so that additional wheel material must be removed with the diamond.

Degree of Dressing

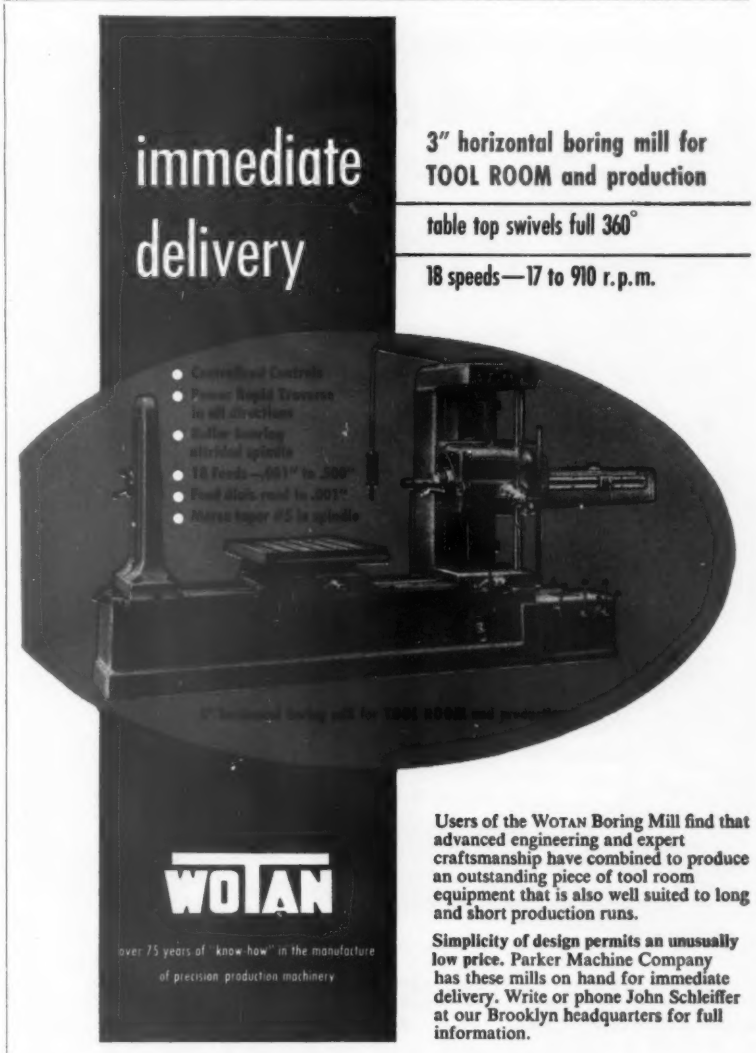
The question then arises as to what is the proper amount of material to remove in a flat dressing operation. The color of the wheel and knowledge of the depths of cut taken during the regular grinding operations prior to dressing can be a guide to this. A wheel will tend to load with work chips more or less according to the depth of cut taken during grinding operations. This loading tends to discolor or "dirty" the wheel. One criterion, therefore, as to whether the wheel is properly dressed is whether the wheel face has a fresh, clean consistent color and is at the same time flat.

Generally, the amount of wheel material that is to be removed depends to a good extent on the maximum depth of cut taken during grinding operations. Thus, if .020" cuts have been taken, ordinarily .020" of wheel material will have to be removed from the wheel face. It is recommended that 3 to 5 thousandths additional be removed beyond the nominal figure to make sure of a "clean" wheel. However, after each few passes of the diamond the operator should examine the wheel face to eliminate the chance of taking off more wheel material than is actually necessary for a complete dressing.

After removal of additional wheel material, it is necessary to make certain that the wheel is "true". This is done as explained previously by means of a sharp diamond passed repeatedly across the wheel face until it ceases to remove material.

Some operators touch the wheel while it is revolving to determine that it is flat and smooth. This practice, however, can be dangerous since the hand may be carried into the wheel housing or the diamond holder. To assure fine finish on flat grinding jobs, wheel edges should be rounded off with a hand stone or a precision tool.

. . . *Continued on page 108*



Users of the WOTAN Boring Mill find that advanced engineering and expert craftsmanship have combined to produce an outstanding piece of tool room equipment that is also well suited to long and short production runs.

Simplicity of design permits an unusually low price. Parker Machine Company has these mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.

Parker Machine Company, Inc.
158 PIONEER ST., BROOKLYN 31, NEW YORK · TRIANGLE 5-2103 and 2157

A PREVENTIVE MAINTENANCE PROGRAM*

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

by George J. Martin
Manager, Mechanical Division
NATIONAL BISCUIT COMPANY
New York, N. Y.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Preventive Maintenance Inspections are the most important phase of the preventive maintenance program. Made at the proper intervals they insure against mechanical breakdown, particularly during production periods. For our requirements, we have two types of inspections:

1. **Running Inspection:** Running inspections are made on equipment that cannot be shut down for more complete detailed inspections. The term "running inspection" implies that the unit inspected was operating during the inspection, or that the inspection was limited and not a thorough overall examination of all parts. Units in operation can be given only a "running inspection" to locate loose parts, vibration, misalignment, wear, lack of cleanliness, lubrication and poor operating condition.

2. **Shutdown Inspection:** Shutdown inspections are made on equipment that is idle and they involve a thorough inspection of all working parts that can be checked without dismantling the equipment. Examples are parts that are concealed or in motion during operation and should include such items as bearings, gears, shafts, collars, pins, belt tension, belting, and lubrication.

Shutdown inspections are much more desirable, but where equipment is in operation on a three shift basis it is quite likely that "Running Inspections" will be made more frequently than "Shutdown Inspections".

The inspection routine should also include making machine adjustments and minor repairs at the time of the inspection providing that the time required to make such repairs or adjustments does not require more than fifteen minutes per unit. This will eliminate delays, reduce repair costs, and make breakdowns infrequent.

All mechanical equipment inspections should be made by assigned mechanics; in many of our plants area mechanics or night shift mechanics who are fully familiar with the equipment make such inspections. It is very important to assign mechanics who are fully familiar with the equipment to be inspected, since they are naturally more qualified to locate machine weakness and worn parts and to recommend

*From a talk given by Mr Martin at the 4th Annual Plant Maintenance Conference.

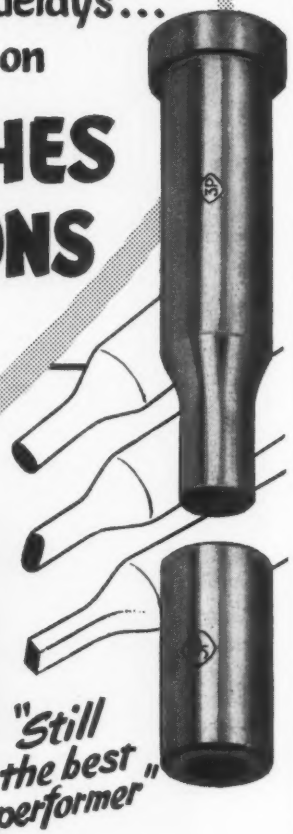
Avoid costly delays... Depend on 3P PUNCHES and DIE BUTTONS

Porter Precision Products offer you IMMEDIATE DELIVERY ON ALL STANDARDS

SPECIALS TO ORDER

3P products help prevent emergencies in your plant with dependable— cost-saving performance — plus — immediate delivery!

"Still the best performer"



PORTER PRECISION PRODUCTS
PRinceton 6338 P. O. Box 208 Cincinnati 15, Ohio

FOR PROMPT SERVICE... CALL

ATLANTA, GEORGIA	RAmond 1195	*LOS ANGELES, CALIF.	TRinity 1539
BUFFALO, N. Y.	1807	*MILWAUKEE, WISC.	BRoadway 2-2076
CHICAGO, ILL.	CLea-brook 3-2905	NASHVILLE, TENN.	2-7208
	MUlberry 5-1840	NORTH HAVEN, CONN.,	ATwater 8-1535
*CINCINNATI, OHIO	KI 5432	NEW YORK, N. Y.	WOrth 2-2142
*CLEVELAND, OHIO	GLenville 1-3083	*PHILADELPHIA, PA.	BAldwin 3-3263
DALLAS, TEXAS	PR 1521	ROCHESTER, N. Y.	MOnroe 5801
*DAYTON, OHIO	ENterprise 1596	SEATTLE, WASH.	ELiot 6644
*DETROIT, MICH.	TRinity 1-3080	SYRACUSE, N. Y.	2-7343
*INDIANAPOLIS, IND.	PLaza 6319	*TULSA, OKLA.	3-6213
KANSAS CITY, MO.	HArrison 0923	*WICHITA, KANSAS	4-2379

* Indicates complete stock.

SEND FOR COMPLETE CATALOG AND PRICES — TODAY!

replacements. As a check on the inspection work, and to insure complete coverage, no mechanic should be assigned to make two consecutive inspections on the same equipment.

Electrical equipment inspections should only be made by assigned, capable electricians in the same manner as outlined for mechanical inspections.

Work Orders. These establish what work is to be done. They provide the data from which material requisitions are prepared, and assignment of tasks to personnel are made. When the work has been completed and all entries have been made, they comprise records that serve in control activities and in expense allocation.

We examined many types and varieties of work order forms before we developed the one which we are now using. They are made out by production personnel as well as maintenance personnel, and accordingly we have a separate space for the production supervisor to indicate what he thinks is required. The mechanic making the repairs indicates specifically, in the space provided, the changes or repairs actually made. We also have space to indicate whether the job is routine, urgent, or can be done only during a shutdown. Type of maintenance personnel required is also indicated. The time spent by the men assigned is recorded on the reverse side of the work order and the summarized labor cost is posted on the bottom of the front side of the form.

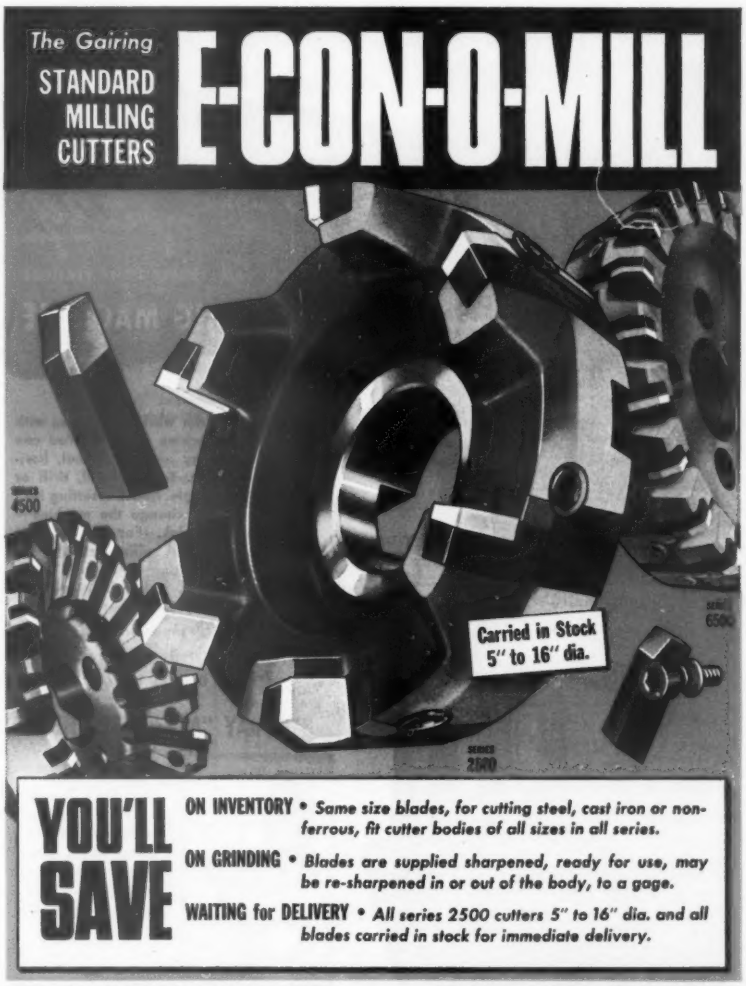
It is most desirable to review closed-out work orders every six months to locate repetitive repairs.

All maintenance work orders are submitted to the maintenance office, where the maintenance clerk assigns a work order number to the form and submits it to the Plant Engineer for approval. The Engineer makes the assignment and does the scheduling. In case of a breakdown or emergency, mechanics are assigned to the job immediately and the work order is made out by the maintenance clerk or by the maintenance supervisor. If more than one department is involved, separate work orders are made out for each job. If two or more trade groups are required on one job, separate maintenance work orders are issued each trade group; however, the work order number is the same for each trade group.

All work orders on completed jobs are turned in to the maintenance clerk who screens the data, checks on the satisfactory completion of the job, and then passes the order on for closing out the job.

The maintenance clerk summarizes the labor and material

. . . *Continued on page 114*


The Gairing
STANDARD MILLING CUTTERS
E-CON-O-MILL
Carried in Stock
5" to 16" dia.
YOU'LL SAVE
ON INVENTORY • Same size blades, for cutting steel, cast iron or non-ferrous, fit cutter bodies of all sizes in all series.
ON GRINDING • Blades are supplied sharpened, ready for use, may be re-sharpened in or out of the body, to a gage.
WAITING for DELIVERY • All series 2500 cutters 5" to 16" dia. and all blades carried in stock for immediate delivery.

TOOLING by GAIRING

Whether you buy one or several sizes, you always save with E-Con-O-Mill. Proved savings in the cost of diamond wheels alone have caused many shops, both large and small, to standardize on E-Con-O-Mill • But, foremost, they're efficient cutters of truly one-piece rigidity • Get the whole story on this great development in standard tooling by writing for our E-Con-O-Mill catalog.

In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14

The GAIRING TOOL COMPANY • 21227 Hoover Road • Detroit 32, Michigan

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

Data Sheet on Desegatized HV-6 HSS now available from Latrobe Steel Co., Latrobe, Pa. Analysis figures, forging, tempering, hardening and annealing data all given. **Circle Inform-A-Gram No. B1.**

Aid In Drill Jig Design is given by current catalog from Colonial Bushing, Inc., Box 37, Harper Station, Detroit 13, Michigan. **Circle Inform-A-Gram No. B2.**

T Nuts, Stud Sets, Strap Clamps and "sure grip" step blocks are described in current literature from Tietzmann Tool Corp., 315 N. Main St., Englewood, Ohio. **Circle Inform-A-Gram No. B3.**

Tracing Templates and a catalog for Lodding clamps and details are now available from Lodding Inc., 73 Beacon St., Worcester, Mass. **Circle Inform-A-Gram No. B4.**

WORK MOVES FASTER
COSTS LESS with a Fray
No. 10-R UNIVERSAL RAM · TURRET TYPE · VERTICAL
MILLING MACHINE
You get a wider work range than with any other machine this size. You can machine at any angle—vertical, horizontal or both. You can mill, drill or bore at any angle. Hence resetting isn't necessary. Just change the machine—changing is quick. (For vertical and regular horizontal milling, use the 10-RH.) Jobs are done faster and better ...at less cost. • It's Universal • Rugged • Easy to Operate.
A high precision tool.
Write for details and specifications.
Bulletin 10.
FRAY "ALL-ANGLE" HEAD TYPE 4
For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.
FRAY
All-Angle
FRAY MACHINE TOOL CO.

High Speed Counterbores and Spot Facers with interchangeable pilots have been added to the line of metal cutting tools of Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Four styles are available —long and short set in both straight and taper shank with two additional styles for the aircraft industry. **Circle Inform-A-Gram No. B5.**

Precision Filing and Sawing Machines are described in a data sheet from Cedar-West Tool Co., Inc., 90 West St., New York 6, N.Y. Full specifications and data given. **Circle Inform-A-Gram No. B6.**

The Monarch 'Fact File' is an interesting assembly of data sheets and other information on the varied production facilities of Monarch Aluminum Mfg. Co., Detroit Ave. at W. 63rd St., Cleveland 2, Ohio. This company coordinates the production of permanent mold and die castings under the supervision of two completely staffed engineering departments. **Circle Inform-A-Gram No. B7.**

Special Die Set Pins and Bushings are designed for minimum maintenance under production conditions. Lubrication is needed only at regrind times, while frozen bushings, scored pins, pulled shanks or die damage due to misalignment or faulty lubrication are eliminated. Write for descriptive literature to Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio. **Circle Inform-A-Gram No. B8.**

Sheldon Precision Lathe Catalog gives all data and features on special features permitting the Sheldon lathe to handle the bulk of everyday toolroom and die shop jobs. From Sheldon Machine Co., 4236 N. Knox Ave., Chicago 41, Ill. **Circle Inform-A-Gram No. B9.**

Rimat Inside Micrometers feature well supported measuring tips for maximum accuracy, feel positively controlled by thimble setting. Bulletin R-3 Rimat Machine Tool Co., 1117 Air Way, Glendale 1, Calif. **Circle Inform-A-Gram No. B10.**

Columbia Extra Header Die Steel is a clean, uniform water hardening carbon tool steel that will give top performance. Data from Columbia Tool Steel Co., 410 E. 14th St., Chicago Hts., Ill. **Circle Inform-A-Gram No. B11.**

New Collet Catalog. Every size and type collet offered in the industry is listed in new catalog 18 from The Sutton Tool Co., Sturgis, Michigan. Absolutely exhaustive coverage of standards and specials. **Circle Inform-A-Gram No. B12.**

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Jig Grinding Attachment for jig borer or mill by the Vulcan Tool Co., Pritz St., Dayton 10, Ohio, is compact, air driven and cooled, and will produce 10 micro finishes using carbide mills, five micro finishes with mounted points. Spindle speeds may be infinitely controlled between 30,000 and 65,000 rpm. The attachment is dependably accurate to "tenths", will finish grind in hardened steel to tolerance.
Circle Inform-A-Gram No. B13.

Live Centers by Sturdimatic Tool Co., 390 F Street, Detroit 16, Michigan have many engineered features for long tolerance retention and first rate performance. Standard shanks with Morse tapers carried in stock.
Circle Inform-A-Gram No. B14.

Plastic Gage Handles One Third Lighter than aluminum, tough, long-lasting and that will not chip or mar are described in literature now available from Federal Tool Corp., 3603 W. Pratt Blvd., Chicago 45, Ill. Possess good insulating qualities and come in four colors for ready identification.
Circle Inform-A-Gram No. B15.

Unit Design Layout Surface Plates may be assembled to form any size unit without accuracy loss. Special analysis semi-steel, 6" thick, 16 standard sizes. Challenge Machinery Co., Grand Haven, Mich.
Circle Inform-A-Gram No. B16.

"Star-Dust" is specially graded diamond lapping compound from the Ace Abrasive Laboratories in all grit and micron sizes, packaged either as dry powder, premixed as a compound, or in special applicator gun. Brochure C-5 gives full details.
Circle Inform-A-Gram No. B17.

Black Granite Surface Plates by Collins Black Granite Surface Plate Co., 2326 E. Eighth, Los Angeles, Calif., are described in current literature. Finished to 50 millionths, impervious to fluid contamination and deterioration.
Circle Inform-A-Gram No. B18.

Gauge Block Jack by Pioneer Tool & Eng'g Co., 3914-3918 W. Shakespeare Ave., Chicago 47, Ill., reduces inspection set-up time 50-75%, adds life to your gage blocks, is fast, simple, and accurate. Literature has all data.
Circle Inform-A-Gram No. B19.

Many Packaging Advantages are possessed by 'CPC', a new plastic from the Calresin Corp., 333 N. Santa Anita, Arcadia, Calif. Inexpensive molding, high cushioning qualities, and stability in temperature extremes are but a few of the many features.
Circle Inform-A-Gram No. B20.

Flat Lapping and Roller Lapping Machines are featured in bulletins now available from Spitfire Tool Co., 2395 N. Pulaski Rd., Chicago 41, Illinois. Finishes to extremely close tolerances are produced.
Circle Inform-A-Gram No. B21.

Specially Designed For the Drill Press, the Yost vise is made in two sizes. Current catalog from Yost Mfg. Co., Meadville, Pennsylvania.
Circle Inform-A-Gram No. B22.

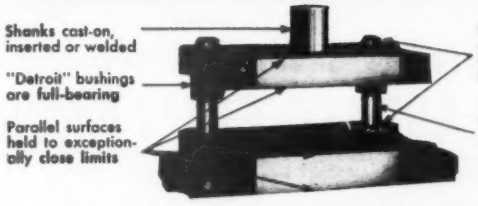
Palmer "Welloct" Pliers are the subject of new two color catalog from the Palmer Welloct Tool Corp., Meadville, Pa. 22 different types described, also hammers.
Circle Inform-A-Gram No. B23.

Transfer Screw Set by Heimann Mfg. Co., Urbana, Ohio, is fast and precise way of transferring open and blind screw holes. Literature.
Circle Inform-A-Gram No. B24.

YOU PAY FOR THE BEST . . .
BE SURE YOU GET THE BEST

FACTORY-BUILT IS BETTER-BUILT

When you specify "Detroit" die sets, you are assured micro-metric precision that means: 1) Lower costs in mounting die in die set and 2) Longer, trouble-free production runs. Factory-built die sets give you what you pay for—parallelism, squareness and finish


Shanks cast-on, inserted or welded
"Detroit" bushings are full-bearing
Parallel surfaces held to exceptionally close limits
Leader pin holes and bushing holes are micro-metric jig bored
"Detroit" precision leader pins are superfinished

Factory-built to the most exacting standards, "Detroit" die sets are also factory-assembled and factory-inspected. You don't have to re-work "Detroit" die sets in your shop to get the accuracy and performance you have a right to expect.

For prompt factory delivery, call "Detroit"

DETROIT	TR 2-5150	MINNEAPOLIS	PR 1822
BIRMINGHAM, ALA.	3-1341	MONTREAL, CAN.	WI 1186
BUFFALO	CI 0163	NASHVILLE	6-2597
CHICAGO	PU 5-7694	NEWARK	MA 2-4318
CINCINNATI	HU 7775	ORLANDO, FLA.	2-3747
CLEVELAND	TO 1-0860	PHILADELPHIA	VI 4-4084
DALLAS	TE 3818	PITTSBURGH	LO 1-4011
DAYTON	HE 3042	ROCK ISLAND, ILL.	RI. 8-2814
INDIANAPOLIS	HU 5604	ST. LOUIS	FR 6811
LOS ANGELES	AD 7251	SEATTLE	SE 7997
MILWAUKEE	GL 3-7170	TOLEDO	MA 4510

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

Screw Machine Chip Separators of bench and floor type are detailed in latest catalog sheets from McKenzie Eng'g Co., Newtown, Conn. Will separate a day's production from the chips in minutes. Any materials.
Circle Inform-A-Gram No. B25.

New Electric Tools Brochure from Portable Electric Tools, Inc., 320 W. 83rd St., Chicago 20, Ill., has all information on a line of ¼", ⅜" and ½" electric drills and on a 6" ¼hp bench grinder. Well arranged for easy reference, also has fabricating information.
Circle Inform-A-Gram No. B26.

Just One Set-Up for Both Rough and Finish Grinding is possible with the Wolters carbide tool grinder. This machine has two wheels mounted concentrically. Optical mike is built in. Full data from Cosa Corp., 405 Lexington Ave., New York 17, N.Y.
Circle Inform-A-Gram No. B27.

All types of Pushers and Collets are featured in latest catalog and price list from Benco Collet & Mfg. Co., 1557 East 27th St., Cleveland 14, Ohio. Solid, squirrel cage heavy duty, "Multi-Split" and "Master" with alloy pads all included.
Circle Inform-A-Gram No. B28.

IF YOU GRIND, POLISH, DEBURR...
FLAT OR IRREGULAR SURFACES....
HARD METALS OR SOFT....
THERE'S A Hammond
ABRASIVE BELT GRINDER
TO FIT YOUR NEED!
SEND SAMPLES — New - Better - Faster Grinding, Polishing, Buffing, and Deburring Machinery is being developed continually here at Kalamazoo. Our Processing Dept. is equipped with 35 modern Hand, Semi-Automatic and Automatic Abrasive Belt Grinders.
Write for Catalog D75, and send one rough and one finished sample for an Engineering Report — no obligation.
Hammond Machinery Builders INC.
1631 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN
Model 400-BDD Abrasive Belt Grinder
Model 50-ED Abrasive Belt Grinder - Polisher
Model VH-6WP WET-N-DRI Abrasive Belt Grinder
Model 3-A Backstand

Fixture Clamp Catalog contains exhaustive listing of the very complete Morton Machine Works line, also includes aid to designers and draughtsmen in form of a tracing template for each item.
Circle Inform-A-Gram No. B29.

Precise Grinder Miller Attachment is described in catalog now available from Precise Products Corp., 1341 Clark St., Racine, Wisconsin. ¼HP, 20,000 to 45,000 rpm. Ideal for carbide cutters.
Circle Inform-A-Gram No. B30.

116 Pages of End Mill Information. Over 1000 sizes and types of end mills, with many new additions including the new "Positiv-Lok" series, are featured in the latest catalog from Putnam Tool Co., 298 Charlevoix Ave., Detroit 7.
Circle Inform-A-Gram No. B31.

The Strand Enclosure Safe-guard is designed completely to protect the hands of press operators, is easily adapted to any style punches and die sets. Complete details from the Strand Mfg. Co., Dept. B. Box 762, Los Angeles 44, Calif.
Circle Inform-A-Gram No. B32.

Model 414 "Sawzall" Hacksaw from Milwaukee Electric Tool Corp., Milwaukee, Wis., is compact, powerful, and all-purpose. Accurately starts its own blind holes. Detailed literature now ready.
Circle Inform-A-Gram No. B33.

"Sheet and Plate Fabrication" brochure from Kirk & Blum Mfg. Co., 3187 Forrer St., Cincinnati 9, Ohio has over 40 pages of ilustrations of the company fabricating plant and facilities. Gives comprehensive view of many typical parts and products manufactured.
Circle Inform-A-Gram No. B34.

"Zetto" #30 Precision Cylindrical Grinder is featured in an 8 page folder from Cedar-West Tool Co., Inc., 90 West St., New York 6, N. Y. Complete and graphic picture.
Circle Inform-A-Gram No. B35.

Extremely Comprehensive Die Set Listing, die maker's supplies set out in easy-to-find sections in current catalog from A. E. Baumbach Mfg. Company, 1812-22 S. Kilbourn Ave., Chicago 23, Illinois.
Circle Inform-A-Gram No. B36.

Hardness Testing on all Types of Work is made possible with the "Scleroscope" by Shore Instrument Mfg. Co., Inc., 9025 Van Wyck Ave., Jamaica 2, New York. Literature covers all models fully.
Circle Inform-A-Gram No. B37.

Micro Supreme Layout and Identification Dye comes in 7 colors for quick stock marking. It shows up in sharp relief, and dries instantly. Circular and samples from Michigan Chrome & Chemical Co., 6340 E. Jefferson Ave., Detroit, Mich.
Circle Inform-A-Gram No. B38.

New Model of Low Priced Parallel Drafting Board is featured in current literature from the Bradford Bailey Co., P.O. Box 440 — Div. 136 Elizabeth, N.J. Many desirable features.
Circle Inform-A-Gram No. B39.

Cutting, Bending and Punching in round or flat metals can all be done on the Multi-Form machine, available in air or hand operated models, several different sizes. Largest work capacity ½" x 4". J. A. Richards Co., Kalamazoo, Michigan.
Circle Inform-A-Gram No. B40.

"Moto-Tools" provide Pocket Machine Shop, are unexcelled for such work as marking parts, grinding dies, sharpening machine tools, and deburring machine tools. Full data from Dremel Mfg. Co., 2420-18th St., Racine, Wisconsin.
Circle Inform-A-Gram No. B41.

Commercial Ultrasonic Testing Services and Equipment are featured in bulletin 50-115 from Sperry Products Inc., Danbury, Conn. Improved quality control and many cost saving applications.
Circle Inform-A-Gram No. B42.

Contract Service for all types of precision grinding work is described in catalog currently available from the Acme Industrial Co., 206, N. Laflin St., Chicago 7, Ill. Also quick and super-accurate flat lapping.
Circle Inform-A-Gram No. B43.

Radi-Form Grinder Attachment will move work in a pre-determined arc of any desired radius, from 1/16" to 2" concave, from 00 to 2" convex. Radii within .0005" can be generated on carbide cutting tools on a standard unformed cupped diamond wheel. From W. F. Meyers Co., Inc., Bedford, Ind.
Circle Inform-A-Gram No. B44.

The Palmer-Shile Line of materials handling equipment includes such items as stock checker's, warehouse, hand and end dump trucks, utilities racks, drum and barrel tilts, sheet steel grabs and vertical drum lifters. The company designs and builds to your needs, for pick-up, loading, moving, dumping.
Circle Inform-A-Gram No. B45.

Bliss High Speed Forging Presses are featured in catalog 42 from E. W. Bliss Co., Canton, Ohio. Capacities t300-4000 tons. All specifications and data.
Circle Inform-A-Gram No. B46.

Dimensional Drawings and Detailed Data on all Zagar broachine machines, collet fixtures and multiple spindle gearless drill heads are featured in the Eng'g Manual from Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland, O. Fully illustrated, valuable and interesting.
Circle Inform-A-Gram No. B47.

For Single Point Carbide or high speed steel tooling, the "Cri-Dan" model "D" threading machine can attain a speed of up to 50 passes per minute. Complete set-up changeover in twenty minutes. Ideal for short run or production jobs. Lees-Bradner Co., Cleveland 11, Ohio.
Circle Inform-A-Gram No. B48.

Profusely Illustrated Bulletin #46 covers the Comtorplug internal gage. Use instructions, features, data on prices, sizes and parts. The Comtor Co., 182 Farwell St., Waltham 54, Mass.
Circle Inform-A-Gram No. B49.

Bench Turret Lathe Literature for small parts now available from Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, Calif. Two collet capacities, lever operated collet closer, double tool cross slide, swivel compound slide, self-indexing 8 position turret.
Circle Inform-A-Gram No. B50.

Standard Optical Comparator Charts that are available for any make and model of projector are subject of new catalog from Gage Co., Battle Creek, Michigan. Thread form and inspection charts, radius and angular layouts.
Circle Inform-A-Gram No. B51.

VLIER Spring Plungers and Stops
Save You Money in Hundreds of Ways
Here are the perfect units for replacing "makeshift" plungers in production and for end product use. Widely used for positioning small parts in fixtures, breaking oil seal in dies, as a locating pin, detents, etc. These units have long life and give trouble-free performance. Economically priced. There is a nearby Vlier distributor to serve you. Write for catalog No. 58 today.
Completely assembled units, available in 17 sizes.
Pre-set, constant (1-42 lbs.) spring pressures. National Coarse Thread No. 1 fit.
Hardened plungers and rust-proof finishes give long life.
True plunger alignment in all positions. Fully telescoping.
SPRING STOPS
For use where fixture design prevents the mounting of spring plungers. Body is jig-drilled for bolting to fixture-base. Has case-hardened, radiused nose. Available in two sizes with 1¼ or 32 lbs. spring pressure.
VLIER
VLIER ENGINEERING, INC.
4552 BEVERLY BLVD., LOS ANGELES 4, CALIF.
Distributors of Torque Thumb Screws, Toggle Pads, Fixture Keys

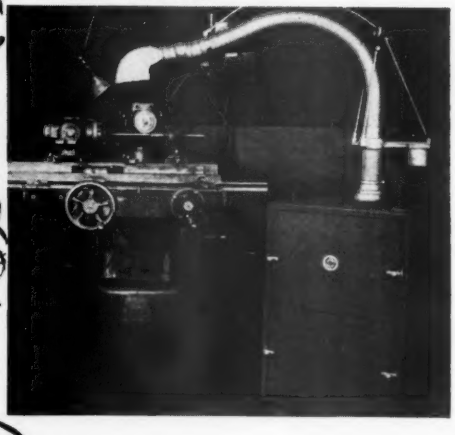
Adjustable Two Spindle Drilling Heads drill two holes at a time, feature variable drilling center adjustments by loosening two hex nuts. Full data Linderme Engineering & Sales, 8132 Puritan, Detroit 21, Michigan.
Circle Inform-A-Gram No. B52.

R. B. Tools in Tungsten Cobalt HSS are combined in set #106B-K. Each set consists of holder and twenty tools. Data sheet from R. B. Tool Co., Hartsdale, N. Y. contains details of these and other combination sets for boring, threading, facing and recessing.
Circle Inform-A-Gram No. B53.

Special Finger Tip Speed Control instantly set for chatterfree cutting is feature of drill press described in bulletin TP-4 from Electro-Mechano Co., 260 E. Erie St., Milwaukee 2, Wis. Spindle speeds 150-4000, ideal for combined production line set-ups.
Circle Inform-A-Gram No. B54.

Jones & Lamson Optical Comparators give unsurpassed inspection versatility, and direct readings accurate to .0001" without computations. 11 models made Catalog 402, Jones & Lamson Machine Co., Springfield, Vt.
Circle Inform-A-Gram No. B55.

This **TORIT DUST COLLECTOR** Gets Around to Get Results



In this shop, doing specialized work, several grinding and cutting machines were used intermittently. Odd shapes and sizes, too, were involved. Here the dust problem was solved with a mobile Torit Dust Collector that could be moved as necessary. A Torit flexible suction tube assembly insured nozzle adjustment to the position best suited for the work being done.

Torit also manufactures a line of cyclone type dust separators. Sizes up to 5 H.P., with or without after-filters.

Standard model Torit Dust Collectors meet the requirements of most dust collecting operations, and special adaptations can be quickly fabricated. Compact and self-contained they are very economical to install, low in operating costs and very easy to maintain. For details write:

see our catalog in MACHINE TOOL CATALOGS or write for copy

TORIT MANUFACTURING CO.
317 Walnut St. St. Paul 2, Minn.

Over 25,000 TORIT DUST COLLECTORS Now in Operation

The Nobur Tool eliminated hand deburring, substitutes speedy machine operation. A pamphlet from Nobur Mfg. Co., 717 N. Victory Blvd., Burbank, Calif., has all data.
Circle Inform-A-Gram No. B56.

Solid Carbide End Mills are treated in catalog 12 from Raymac Mfg. Co., 3729 Cass Ave., Detroit, Michigan. Also featured are solid carbide centerlaps, with constant maintenance of correct angle.
Circle Inform-A-Gram No. B57.

Current D-S Grinder Catalog is offered by Royal Oak Tool & Machine Co., D-S Grinder Div., 613 E. Fourth Ave., Royal Oak, Michigan. Hand and power operated models give radically improved tap, drill, and counterbore grinds.
Circle Inform-A-Gram No. B58.

Low Cost Precision is available in the "Tuna" vernier caliper from Swedish Gage Co. of America, 8900 Alpine Ave., Detroit 4, Michigan. Best Swedish steel, hardened measuring surfaces. Full specifications from maker.
Circle Inform-A-Gram No. B59.

Lever, Screw, and Air Feed Models of the Nichols miller are featured in latest catalog from Nichols-Morris Corp., 50-X Church St., New York 7, N. Y. Also three types double spindle machines.
Circle Inform-A-Gram No. B60.

"Micro-Miniature" End Mills are subject of a new pocket size 16 page catalog from Woodson Tool Co., 4811 W. Lennox Blvd., Inglewood 2, Calif. Full size range given, quick reference listing. Feature polished flutes for fast cutting.
Circle Inform-A-Gram No. B61.

"Hirschmann Highlights" is a house organ now available from Carl Hirschmann Co., Manhasset, New York. Has interesting data on many different precision Swiss machine tools. Includes complete tooling case history for manufacture of a precision pinion over five machines. **Inform-A-Gram No. B62.**

Full Details on nut and clamp type Lamina guide pin bushings are given in current literature from Lamina Dies & Tool, Inc. This bulletin is well illustrated and designed for easy reference, contains also information on a variety of other Lamina tools, dies, and die-making equipment. **Inform-A-Gram No. B63.**

Commander Production Tools are subject of attractive brochure from Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill. Tappers, multiple drill units, chip breakers and coolant tables featured.
Circle Inform-A-Gram No. B64.

Clamp Support Blocks from Podlin Tool Co., 3918 Wesley Terrace, Schiller Park, Ill., give stable adjustment from ½" to 10", are instantly adjustable, only two parts.
Circle Inform-A-Gram No. B65.

New for '53 Press Room Equipment catalog has just been released by Durant Tool Supply Co., 155 Orange St., Providence 3, R. I. Included is the company's new "Select-O-Matic" indexer, a new line of coil cradles, and an enlarged line of stock straighteners.
Circle Inform-A-Gram No. B66.

Webber Gage Blocks are now made in a carbide having the same coefficient of expansion as steel. Great corrosion resistance and accepted carbide resistance to wear are also features. Webber Gage Co., 12903 Triskett Rd., Cleveland 11.
Circle Inform-A-Gram No. B67.

Sharp Image Definition with glare-free accuracy is feature of "Century" optical comparator. Illustrated circular describes features and operation. From Portman Instrument Co., 6 Manhasset Ave., Port Washington, N. Y.
Circle Inform-A-Gram No. B68.

Complete Catalog and Price List of punches and die buttons is now available from Porter Precision Products, Cincinnati 31, Ohio. Immediate delivery over wide stock range now possible.
Circle Inform-A-Gram No. B69.

P.D.Q. Tool Holder permits faster tool changes and assures accurate repositioning. 3 point holding eliminates run-out. Adaptors for turret lathe, end mill, shell mill, drill chucks and boring heads. Portage Double-Quick Tool Co., 1046 Sweitzer Ave., Akron, Ohio.
Circle Inform-A-Gram No. B70.

Electronic Air Cleaners provide more efficient means of absolute atmospheric decontamination and purifying than any other known method. New catalog E-60 from Trion, Inc., 1000 Island Ave., McKees Rocks, Pa., has complete data and information on a line of equipment, some models of which cost only as much as an ordinary light bulb to run.
Circle Inform-A-Gram No. B71.

Adcock & Shipley Plain and Universal Milling Machines are featured in a new catalog now available from Air Transport Equipment Inc., Opposite Roosevelt Field, Mineola, N.Y. All data, specifications and feature description.
Circle Inform-A-Gram No. B72.

Special Boring Bars and Microbore Tools are now packaged together for work demanding highest production. Latest catalog from DeVlieg Microbore Co., 450 Fair Ave., Ferndale, Michigan, has all data.
Circle Inform-A-Gram No. B73.

Adjustable Rod Guard for Punch Presses is one of the complete line of guards shown in the current catalog from Humm Safety Equipment Co., 253 Sheffield Ave., Brooklyn 7, New York.
Circle Inform-A-Gram No. B74.

Vernier Height Gages, Calipers, Depth Gages, thread, ring, and snap gages represent just a few selections from the enormous stock of the Sid Tool Co., Inc., 126 Lafayette St., New York 13, N. Y. Mailing list now open for new names.
Circle Inform-A-Gram No. B75.

Geared Head Precision Gap Lathes in a size range from 16" to 28" are described in illustrated literature from the Parker Machine Co. Featured are 12 spindle speeds, built-in lubrication pump and quick change gear box.
Circle Inform-A-Gram No. B76.

"One-Punch" Job of most Trimming Operations is made possible with the Brehm "shimmy" trimming die, which will cut four ways in one press stroke. Process described in catalog now available from Steel Products Engineering Co., Brehm Die Div., Dept. K. Springfield, Ohio.
Circle Inform-A-Gram No. B77.

Compound Microscope Base has 6" lateral and 4" traverse micrometer motion. This instrument does double duty as accurate machining table and complete toolmaker's microscope. Erb & Gray, 854 S. Figueroa St., Los Angeles 17, Calif.
Circle Inform-A-Gram No. B78.

FG

THE Hallmark OF

Precision Gage Blocks

Both Square and Rectangular
FONDA GAGE BLOCKS
NOW IN ALL THREE MATERIALS

STEEL
CARBIDE
CHROME CARBIDE

84-piece set rectangular

Also smaller sets and individual blocks from .010" to 4.000"

84-piece set square

FONDA REPRESENTATIVES

H. R. BERKSHIRE
Tenafly, N. J.
COOPER TOOL & ENG.
Minneapolis, Minn.
JOSEPH FLETCHER
San Francisco, Calif.
FORS SALES CO.
Detroit, Mich.
GIBESTON TOOL CO.
Elmira, N. Y.
W. H. GOURLIE CO.
West Hartford, Conn.
W. J. GREENLEAF CO.
Pittsburgh, Pa.
HOMER B. JOHNSON
Chicago, Ill.
A. D. MILLER
Muncie, Ind.
H. O. MONAHAN
St. Louis, Mo.
P. A. PATTERSON CO.
Philadelphia, Pa.
REASONER TOOL CO.
Boston, Mass.
WILLIAM RIGGS CO.
Tulsa, Okla.
A. J. ROD
Huston, Texas
A. D. SCHNEIDER CO.
Lansing, Mich.
SHIVELY BROS.
Flint, Mich.
EDWARD SIMITH
Milwaukee, Wis.
P. B. SLATER
Los Angeles, Calif.
H. F. SODERLING
Seattle, Wash.
SYBRANDT CO.
Cleveland, Ohio
A. C. WICKMAN
Toronto, Canada
F. M. WILSON
Buffalo, N. Y.
WOODALL SALES
Dayton, Ohio

QUALITY – Lasting precision – in millionths – has led to the constant use of FONDA gage blocks by all the nationally known companies who know that "if it requires precision in millionths, it requires FONDA."

PRICE – As a result of advanced engineering, expanded facilities, and a continuous research program, FONDA has maintained their traditionally low prices in spite of rising costs.

DELIVERY – Through enlarged manufacturing facilities, FONDA can now ship most orders *direct from stock* and give short delivery dates on all other items.

For additional information on gage blocks simply attach this coupon to your business letterhead and send it on to us – no obligation of course.

I would like to know more about FONDA gage blocks. Please, send me your descriptive brochure entitled "Precision in Millionths"

NAME _____ TITLE _____
COMPANY _____
BUSINESS ADDRESS _____
CITY _____ ZONE _____ STATE _____

FONDA
FONDA GAGE SALES CORP.
38 Broad St., Port Chester 2, N. Y.

L & J Presses are Precision Engineered for dependable service with minimum maintenance. 12 OBI models, back geared and plain flywheel types, 8 sizes from 6 to 80 ton capacity. Data — L. & J. Press Corp., 1626 Sterling Ave., Elkhart, Indiana.
Circle Inform-A-Gram No. B79.

Low Maintenance and High Production are boasted by Rousselle punch press line of the Service Machine Co., 7627-33 S. Ashland Ave., Chicago 20, Ill. OBI, horn, and deep throat types.
Circle Inform-A-Gram No. B80.

Carbide Tools and Holders are described in literature now available from Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, Ill. Available in either cased sets for toolroom and maintenance, or individually for production.
Circle Inform-A-Gram No. B81.

Solid Carbide Tools, end mills, center laps, grinding tools, midget burrs and rotary files are treated in latest catalog from R. L. Schmitt Co., 6536 Roosevelt, Allen Park, Mich. Standards and specials.
Circle Inform-A-Gram No. B82.

The Land You Build On Requires Marking Devices

When measuring land areas or construction sites, surveyors mark boundaries with stakes or chalk. Working crews then can depend on these marking devices to insure dimensional limits and safeguarding of property rights.

CADILLAC 45
HYDRAULIC MARKING MACHINE
The Perfect Machine for Flat, Round and Contour Marking

PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.

SOLID ROLL DIE
Assuring the utmost in accuracy—used in marking machines, lathes and screw machines.

ENGRAVED STEEL SEGMENT DIES
Segment die system ideal for stamping circular and flat work (trademarks, sizes, etc.).
Write for Bulletin SE-130

Compact, self-contained and manifold mounted, this machine gives full range of marking depth with one control from extremely shallow impression up to very deep impression. It will mark round, flat and irregular surfaces. Features: repeat action; capacity up to 110 one inch strokes per minute; up to 12,000 lbs. pressure.

For full information, write for Bulletin H-45

CADILLAC STAMP CO.
FACTORY and OFFICES
17303 RYAN ROAD • DETROIT 12, MICH.

Carbonitriding and Case Hardening Case Histories are detailed in a new brochure on the Lindberg carbonitriding furnace now available from the Lindberg Engineering Co., 2458 West Hubbard St., Chicago, Ill. Six separate applications are described.
Circle Inform-A-Gram No. B83.

Torrington Makes Many Small Precision Parts. Some of the many described and illustrated in a new brochure are special pins and pivots; all types of rotary swaged rods; wires and tubing in practically all kinds of metals; grinding wheel mandrels; abrasive points and polishing wheels; perforating punches in straight carbon or alloy steels; screwdriver blades and tapered or pointed wires and rods. Your copy from the Torrington Co., Specialties Div., 500 Field St., Torrington, Conn.
Circle Inform-A-Gram No. B84.

Indicator Catalog from Tubular Micrometer Co., Box 30, St. James, Minn., has data on a complete line of dial indicators. Entire line has high-visibility reading for speed and accuracy. Very complete.
Circle Inform-A-Gram No. B85.

Hydraulic Duplicator Applications are detailed and discussed in latest catalog from Walker. The Walker may be easily applied to almost any metal cutting machine to speed production, cut labor costs, and produce first class results.
Circle Inform-A-Gram No. B86.

Die Set Wear Arrested with Acro pin oilers. Bulletin TD-30 from the Acro Metal stamping Co., gives complete information on eliminating bushing wear and leader pin scoring, retaining die set accuracy.
Circle Inform-A-Gram No. B87.

Catalog 16-52 from Whitney Metal Tool Co., Dept T & P, Rockford, Ill., contains details of the complete company line of power and hand presses, etc. Model No. 127 is especially interesting in having special flywheel positioning, workhandling capacity and safety factor.
Circle Inform-A-Gram No. B88.

Swiss Type Automatic Screw Machines are described in literature which is now available from Machinery Div., Hofmann Needle Wks., Inc., 635 59th St., West New York, N.J.
Circle Inform-A-Gram No. B89.

#B860 Tool and Cutter Grinder featured in current graphically illustrated catalog from K. O. Lee Co., 1115 First Ave., Aberdeen, S. Dakota. All details of this low-cost machine are included.
Circle Inform-A-Gram No. B90.

18" Drill Press for Precise Production is described in literature now available from Clausing Div., Atlas Press Co., 2312 N. Pitcher St., Kalamazoo, Michigan. Many plus features.
Circle Inform-A-Gram No. B91.

3 Universal Grinders are described in latest catalog from the Browne & Sharpe Mfg. Co., Providence, R. I. These machines have a swing of 14", and distance between centers of from 30 to 60". The catalog is well laid out, makes possible easy appraisal of all features. Point by point pictorial description is supplemented by tabular specifications.
Circle Inform-A-Gram No. B92.

Short Run Horning and flange notching problems solved with Leslie model "A" hand punch press. All data from Leslie Welding Co., 2937 Carroll Ave., Chicago 12, Ill.
Circle Inform-A-Gram No. B93.

Complete Listing of Drill Jig Bushings is given in latest literature from the Universal Engineering Co., Frankenmuth, 8, Mich. Maximum efficency and long life result from careful machining of fine steel, superhoned bores, and rigorous inspection in manufacturing stages.
Circle Inform-A-Gram No. B94.

Corrosion Proof Instrument Tubing is subject of new bulletin L-6506 from Samuel Moore & Co., Dekoron Tubing Div., Mantua, Ohio. This product positively will not corrode. Three different types.
Circle Inform-A-Gram No. B95.

Nesting Type Tote Pans, by J. L. Lucas & Sons, Inc., Bridgeport, Conn., are 20" long by 12" wide and 6¼" deep. 16 Ga. Complete data now available.
Circle Inform-A-Gram No. B96.

A Swedish Universal Tool Grinder (type UTG-8) is described in a catalog sheet now available from Nife Inc., Copiague, Long Island, N.Y. All features and specifications.
Circle Inform-A-Gram No. B97.

Ideal For Small Milling Machines, the L-W #SD 6½" swing dividing head has low first cost and combines accuracy, ruggedness, and quality. Full data on this and other machine tool attachments is available from L-W Chuck Co., 72 S. St. Clair St., Toledo 4, Ohio.
Circle Inform-A-Gram No. B98.

Large Size and Capacity Range is now available in the Wells metal cutting band saw, which has low first cost. Consistently accurate and dependable production work. Bulletin — Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Michigan.
Circle Inform-A-Gram No. B99.

U. S. Tool Co. "Multi-Slide" elimnates secondary operations and consequent handling and inspection stages. In the production of precision formed stampings from coil stock it completes a finished part at each machine stroke. Bulletin #15 contains complete specifications of the No. 33, which has a capacity for material up to 2½" wide. U. S. Tool Co., Inc., Ampere, East Orange, N.J.
Circle Inform-A-Gram No. B100.

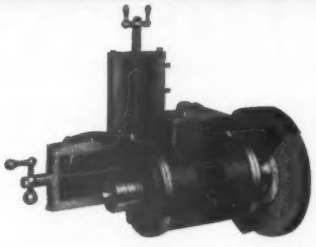
Brochure Gives Help and Information on the best application of the friction sawing process. Cut-off and trimming in a wide materials range from armor plate to glass is more accurate and much speedier. Tannewitz Works, Grand Rapids, Mich.
Circle Inform-A-Gram No. B101.

Reltool End Mills and Holders are priced and given full description in latest discount sheet and catalog No. 50 from Reltool Corp., 412 W. Michigan St., Milwaukee 3, Wis. Over 1000 stock sizes, many different styles.
Circle Inform-A-Gram No. B102.

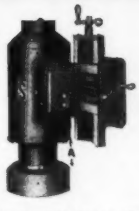
New Starrett Air Hardening Flat Stock has been specially developed for punch and die use for long production runs or under extreme wear conditions. High non-deformation characteristics for maintenance of dimensional accuracy during heat-treating process. L. S. Starrett Co., Athol, Mass.
Circle Inform-A-Gram No. B103.

Mirror Finishes in Minutes are given by "Micro-Mesh" pure diamond compound. Suitable for any precision finishing problem. For details apply A-I Abrasive Laboratories, 139 Duane St., N.Y. 13, N.Y.
Circle Inform-A-Gram No. B104.

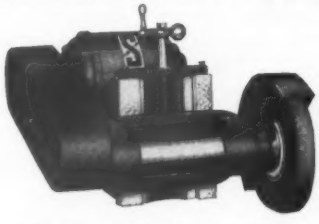
it's STANDARD for Motorized Spindles



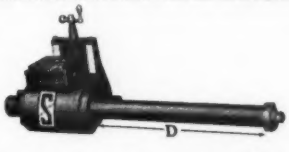
Angle Plate Grinder with horizontal and vertical feeds. ¼ to 10 H.P.



Vertical Spindle Grinder with or without feeds. ½ H.P. to 50 H.P.
"A" dimension to order up to 16". For Planer, Boring Mill, Surface Grinder, Milling Machine.



Belt Driven Lathe Grinder. ¼ H.P. to 20 H.P.



Internal Grinder, direct motor drive. Grind up to 30" deep. ½ to 5 H.P.

Belt Driven Internal Grinder. Grind up to 24" deep. ¼ to 5 H.P.

Vertical Spindle Grinder, belted motor drive, ½ to 5 H.P.

B = Adapter to fit in ram of Boring Mill.

Write for Catalog 44

THE STANDARD ELECTRICAL TOOL CO.
CINCINNATI 4, OHIO

Flexible Shaft Machines. Complete line of machines for every "small-work" job of grinding, finishing, deburring, etc. Catalog from Foredom Electric Co., 27 Park Place, New York, N. Y. has all data, includes also heavy and medium duty models.
Circle Inform-A-Gram No. B105.

Angle & Radius Dressers by Sperman Metal Specialties, 1085 Rogers Ave., Brooklyn 26, New York are described in a circular now available. Compact design allows dressing from underneath wheel. Full data now ready.
Circle Inform-A-Gram No. B106.

Hardened and Ground H.S.S. Blanks in any decimal diameter to ½" and in any length are covered in current literature from William T. Hutchinson Co., 235 Main St., Orange, N.J. Mirror finish close tolerance surface.
Circle Inform-A-Gram No. B107.

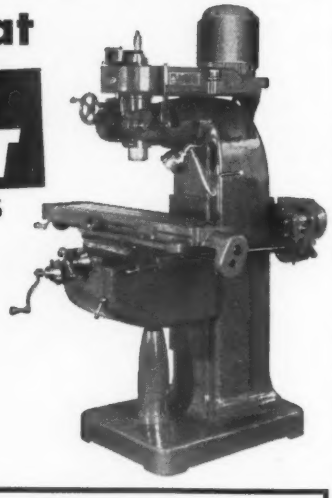
Lectroetch Inspection Markers are described in new folder from the Lectroetch Co., 14925 Elderwood Ave., E. Cleveland 12, Ohio. Complete maintenance and working instructions are given for the unit, which is compact, fool-proof, and easy to use.
Circle Inform-A-Gram No. B108.

INDEX MILLING MACHINES

Pay Off in ACCURACY and TOP PERFORMANCE at

an Amazingly LOW COST

Model 55



Milling, Drilling and Boring need not be expensive . . . Thousands of metal-working plants have learned it . . . Index Mills are the answer . . . Their demand is big and constantly growing. Pictured is the improved VERTICAL MODEL 55, a large capacity, versatile machine . . . Has a speed range of 80 to 2700 RPMs, 1 H.P. drive, 3⅛" quill, extra rugged spindle, capacity of ⅛" to 1½" end mills in tool steel. Spindle quill travel, 5¼". Table 40" x 9" or larger.

VERTICAL MODEL 40
An outstanding machine that has proved itself in highly satisfactory service for 15 years. While it is not a jig borer, it is widely used for accurate boring and locating. The improved spindle drive gives nine spindle speeds, an ample range for all operations. CAPACITY, ⅛" to 1" end mills in tool steel. TABLE, working surface 8" x 26", 8" x 34" overall.

HORIZONTAL MODEL 60
A simple, efficient machine that in many ways equals or exceeds a light No. 2 in capacity. Designed for the average tool room, but its rigidity and low maintenance cost make it suitable for production shops. Standard table 40" x 9" with larger table optional. Compact and with all operating parts enclosed yet readily accessible. Controls conveniently located for ease of operation.

INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

"Hardsteel" Operators Manual gives valuable aid in showing how to drill hardened steel without annealing. Hard-steel drills work with equal ease on work-hardening steels and high-carbon—high chrome steels of any degree of hardness. Black Drill Co., Inc.
Circle Inform-A-Gram No. B109.

New Bushing Catalog from Acme Industrial Co., simplifies and speeds selection, has complete data. Also includes liners, leader pins, dowel pins, etc.
Circle Inform-A-Gram No. B110.

Etalon No. 9 Vernier Caliper features a measuring capacity of 7", has hand-fitted vernier for smooth, snug operation. .001" and 1/64" Write Alina Corp., 401 Broadway New York 13, N. Y.
Circle Inform-A-Gram No. B111.

Technical Information and descriptive literature on Allen Head screws are offered by Allen Mfg. Co. Many manufacturing and materials improvements have been made to assure a better quality and uniformity. This is a complete guide.
Circle Inform-A-Gram No. B112.

22 Models of Dust-Collectors are included in the standard range of the Aget-Detroit Company described and illustrated in catalog 605-2. Capacities range from 300 to 10,000 cfm, most any need can be met from stock.
Circle Inform-A-Gram No. B113.

All Types Holding Fixtures for machine shop production are described in exhaustive catalog from Swartz Tool Products Co., Inc., Detroit. Paramount interest to designers and builders.
Circle Inform-A-Gram No. B114.

Additional Sizes of Cut Thread Studs have been added to the stock listing of the Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio. Range now covers studs from 2" to 20" long in 5/16-18; ⅜-16; ½-13; ⅝-11; ¾-10; ⅞-9; and 1"-8.
Circle Inform-A-Gram No. B115.

Complete Line of Carbide Dies and Accessories is described in new bulletin D-130 from Carboloy Dept.. G. E. Co., Detroit 32, Michigan. Plus features of catalog include split gage, standard wire, and decimal equivalent tables.
Circle Inform-A-Gram No. B116.

Speed Measuring Instruments representing at least one type for any job in your shop are discussed in bulletin 35, from James G. Biddle Co., 1316 Arch St., Philadlephia 7, Pa. Resonant reed tachometers, frequency and rate-ob-vibration indicators, and chronometric speed indicators are but a few of those included.
Circle Inform-A-Gram No. B117.

Finishing Manual from Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, New York, contains operational and parts data on abrasive hand grinder models, which feature improved belt tension device. **Inform-A-Gram No. B118.**

Duplicating Equipment available from the Tracer Control Co., Hazel Park, Mich., has special features to permit universal application, will profile and contour on a production basis. Current catalog has all data. **Circle Inform-A-Gram No. B119.**

Air Power Applications are featured in a new catalog now available from Mead Specialties Co., 4114 N. Knox Ave., Dept. HA-82 Chicago 41. Air vises, presses, cylinders, and work feeders are all described, many helpful hints are given. **Circle Inform-A-Gram No. B120.**

New 5-Way Drilling and Tapping Machine for aircraft engine housings is described in bulletin 103-35 from Modern Industrial Eng'g Co., 14230 Birwood, Detroit 4, Michigan. Photo, complete operating description and specifications. **Circle Inform-A-Gram No. B121.**

Hand Feed Replaced Easily with the Acro-Bore boring unit, adaptable to boring heads, having a steady feed in any belt position. Gives fast accurate work with maintained tolerances and longer tool life. Skyline Tool & Gage Co., 4127 Newark Ave., Cleveland 9, Ohio. **Circle Inform-A-Gram No. B122.**

276,000,000 Standard Punch Sizes and Types are now available at standard prices from Pivot Punch & Die Corp., 373 Old Niagara Falls Blvd., North Towawanda, New York. Catalog 514 tells story. **Circle Inform-A-Gram No. B123.**

Roll Feeds and Adjustable Reel Stands are described in current literature from the Wittek Mfg. Co., 4323 W. 24th Place, Chicago 23, Ill. Standard models for wide variety of press sizes and models. **Circle Inform-A-Gram No. B124.**

P-K Quality Controlled Self-Tapping Screws are featured in latest bulletin. Each type screw is detailed as to size and styles, with typical applications. Parker-Kalon Corp., 200 Varick St., New York 14, N.Y. **Circle Inform-A-Gram No. B125.**

Precision Die-Making Techniques illustrated and discussed in latest brochure from Harig Mfg. Corp., 5761 W. Howard St., Chicago 31, Ill. Now ready and available. **Circle Inform-A-Gram No. B126.**

Bar Knobs in Wide Size Range of malleable iron can be had blank, drilled and reamed and tapped from West Point Mfg Co., 26935 West 7 Mile Rd., Detroit 19, Michigan. Give strong clamping action for dies, jigs, fixtures, etc. **Circle Inform-A-Gram No. B127.**

52-Page Book of drawings, specifications, and prices on the Noble & Stanton line of standard jig and fixture parts is now available. If you can use, will save two-thirds the cost of tool-room manufacture. Tracing sheets to cut design time are also to be had. **Circle Inform-A-Gram No. B128.**

Graphitic Tool Steel excells for die use, has outstanding anti-friction qualities with minimum tendency to scuff, seize, score or gall. Graphitic steel book from Timken Roller Bearing Co., Steel & Tube Div., Canton 6, Ohio, has all data. **Circle Inform-A-Gram No. B129.**

15 Page Catalog from the Alina Corp., 401 Broadway, New York 4, N. Y., contains details of the complete line of precision Etalon measuring instruments, features such items as a dial micrometer that will measure an anvil movement of 1/100000". **Circle Inform-A-Gram No. B130.**

High-Speed Heat-Treat Furnaces offer wide temperature range for any steels, dies, tools, etc. Carbofrax hearth, G. E. motor, Johnson blower. Full data Johnson Gas Appliance Co., 624 East Ave., Cedar Rapids, Iowa. **Circle Inform-A-Gram No. B131.**

No. 150 "Miti-Mite" is a magnetic base holder for mounting test indicators to flat or curved surfaces. Detailed descriptive literature from Enco Mfg. Co., Dept. 782, 4524 W. Fullerton Ave., Chicago 39, Ill.
Circle Inform-A-Gram No. B132.

Complete Data on Cleaning of metal surfaces and assemblies, preparation for painting and stripping organic finishes is contained in a new catalog on industrial chemicals and processes from Whitfield Chemical Co., 14225 Schaefer Highway, Detroit 27, Mich.
Circle Inform-A-Gram No. B133.

Automatic Transfer Machines are described in latest bulletin from Motch & Merryweather Machinery Co., Penton Bldg., Cleveland 13, O. Features include simultaneous cut-off, double end machining, and reduction in floor space, handling, tooling and labor costs.
Circle Inform-A-Gram No. B134.

Baldor Fan Motors of single phase, polyphase, and DC types in capacities from 1/30 to ¾ hp are discussed in new bulletin 500 from Baldor Electric Co., 4353 Duncan Ave., St. Louis 10, Mo. Specifications and mounting data given.
Circle Inform-A-Gram No. B135.

SHELDON
CHICAGO U.S.A.
PRECISION LATHES

SHELDON
"Stamina" Features:

- Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways 2 Flat ways
- Full Double-Walled Aprons—all gear shafts supported on both ends.
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.

Precision that lasts
. . . "ZERO PRECISION" TIMKEN TAPER ROLLER BEARINGS

No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

Write for Catalog

SHELDON MACHINE CO., INC.
4235 N. Knox Ave., Chicago 41, Illinois

Two Types of Quality Control Chart Holders are featured in new bulletin No. 159-22 from the Visi-Trol Corp., 9345 Hubbell Ave., Detroit 28, Mich. Included are specifications and descriptions of type "A" holders for "in process" records and type "B" holders for permanent records. Copies available to readers.
Circle Inform-A-Gram No. B136.

RB Punches and Die Buttons have special locking device for instant insertion with accurate alignment, save time in die design, construction, and operation. They are standard, quickly mounted without machining, and cut press down time. 52 page R-B catalog from Allied Products Corp. has full specifications.
Circle Inform-A-Gram No. B137.

Comprehensive Catalog of end mills with special attention to sizes from .1875 down is available from the Woodson Tool Co. Mills feature polished flutes for fast cutting, long life, strength.
Circle Inform-A-Gram No. B138.

Weldon Measuring Attachment for lathes directly computes forward or reverse carriage movement within .001". Easily fitted to any lathe. Circular LA-1 from Weldon Tool Co.
Circle Inform-A-Gram No. B139.

Literature on Whistler Magnetic and Adjustable Perforating Dies is now available from S. B. Whistler & Sons, Inc., 748 Military Rd., Buffalo 23, N. Y. Quick making-up of die set is the big feature to eliminate down-time and cut costs.
Circle Inform-A-Gram No. B140.

All 60° Standard and Special Threads are quickly checked between pitch ranges of 4 to 56 with new thread triangles. Calculation by adding a constant to OD. Bulletin from Montgomery & Co., Inc., 53-T Park Place, New York 7, N. Y.
Circle Inform-A-Gram No. B141.

"Photocopying" is New Way to duplicate blueprints and shop instructions without the necessity for washing and developing and drying equipment, etc. New 12-page booklet tells the complete "Autostat" story. From American Photocopy Equipment Co., Dept. TP. 81, 2849 N. Clark St., Chicago 14, Ill.
Circle Inform-A-Gram No. B142.

"Hy-Ten" Alloy Steels are described in a detailed data book from Wheelock, Lovejoy & Co. Type "M" temper alloy steel is included, has great toughness at high degree of hardness—long-wearing qualities.
Circle Inform-A-Gram No. B143.

Features for Speedy Measuring plus knife edges for thread measurement and depth gage blade are incorporated in the "AMIC" vernier caliper from American Measuring Instruments Corp., 240 W. 40th St., New York, N. Y.
Circle Inform-A-Gram No. B145.

New 16" 12 speed Lathe is described in bulletin 5302 from South Bend Lathe, South Bend 22, Indiana. Many outstanding features are well illustrated. Specifications, descriptions and prices make up the text. Pushbutton control system.
Circle Inform-A-Gram No. B146.

All the Latest Developments in the type "BL" hole punching units including a specified stripping guide on the BL-3 and BL-3½ units are featured in new catalog Bl from Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N.Y. Pages 24 through 31 of the three color catalog have general information drawings providing helpful set-up explanations.
Circle Inform-A-Gram No. B147.

Bulletin on Winslow Super Sensitive Tapping Head is now ready from Winslow Product Eng'g Corp., Los Angeles 22, Calif. Sensitive high speed performance in 0-80 holes in steel. Fingertip control.
Circle Inform-A-Gram No. B148.

New Alemite "Versatal" Pump is described in new brochure from Alemite Div. Stewart Warner Corp., Diversey Parkway, Chicago, Ill. Case history style, gives many applications of this equipment.
Circle Inform-A-Gram No. B149.

New Counterbore Flute Development permits deep operations with a wider range of pilot sizes gives faster chip removal for cool cutting. This and a full range of standard cutters in latest catalog from Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Michigan.
Circle Inform-A-Gram No. B150.

Particularly Useful in High Temperature Applications. Molykote M-30 is a new heavy duty lubricant developed by the Alpha Corporation. 179 Hamilton Ave., Greenwich, Conn. Full description of properties and prices available.
Circle Inform-A-Gram No. B151.

Dykem Hi-Spot No. 107 is described in new mailing sheet from the Dykem Company, 2307 N. 11th St., St. Louis 6, Mo. This preparation will not dry out, remains in condition on the work indefinitely. Saves your scraping time.
Circle Inform-A-Gram No. B152.

Granite Surface Plates. A catalog sheet with list of standard sizes and prices on black granite surface plates is available from Lawley Granite Surface Plate Co., 1412 Packard Bldg., Phila 2, Pa. Overall accuracy to .00005".
Circle Inform-A-Gram No. B153.

Special Reamer Set for dowel pin holes has been developed by Lavallee & Ide, Inc., Chicopee, Mass. Fourteen reamers, in pairs from ⅛" by sixteenths. Back tapered, no flute relief. Full data available.
Circle Inform-A-Gram No. B154.

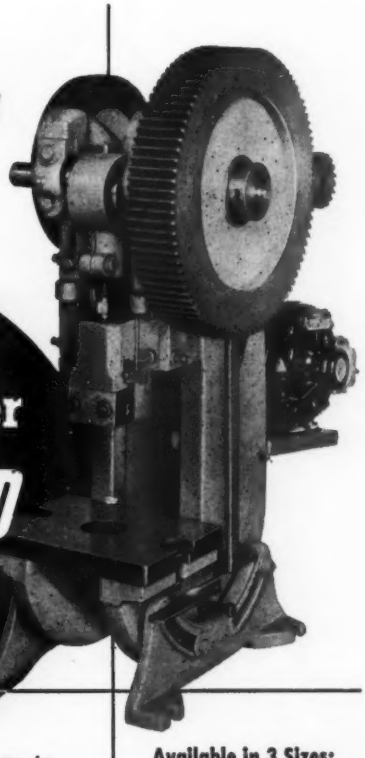
Data Sheet on the Ottman vertical punch and form shaper is now available from Cedar-West Tool Co., Inc., 90 West St., New York 6, N.Y. Permits manufacture of punch and base plate in one solid piece, utilizes standard shaper tools.
Circle Inform-A-Gram No. B155.

Punch Press Stop by the Brinnel Co., Simsbury, Conn., has electrical and mechanical operation combined, gives many plus safety and efficiency features. Universally adaptable to punch presses with mechanical clutches. Literature now available.
Circle Inform-A-Gram No. B156.

Multiple Unit Tumbling Barrels for high-production deburring, cutting and finishing of metal, plastic and wood parts are described in new bulletin MU-52 from Tumb-L-Matic Inc., 4510 Bullard St., New York 70, N.Y. Contains abrasive compound recommendations, presents graphic picture of the newest equipment in this expanding field.
Circle Inform-A-Gram No. B157.

Hand Wheels, Knobs and Machine Handles are featured in a four page brochure from Tomco Products Co., 1633 Douglas Ave., Racine, Wisconsin. Complete dimensions and data.
Circle Inform-A-Gram No. B158.

When a SLOW STROKE will speed production...



GET A benchmaster BACK-GEARED PUNCH PRESS!

Benchmaster gives you the answer to deep-draw and forming operations on small presses...The new BACK-GEARED Series! Built to the same rigid specifications as standard and deep throat models, but now equipped for SLOW, POWERFUL STROKES ranging from only 40 to 100 per minute! Benchmaster Automatic Friction Roll Feeds available in several roller widths for automatic feeding.

benchmaster
MANUFACTURING COMPANY
1835 West Rosecrans Ave., Gardena, California

Available in 3 Sizes:
4 Ton Standard
4 Ton Deep Throat,
7½ Ton models.
Shut heights and other general specifications remain the same as standard models.

Ask for facts today!

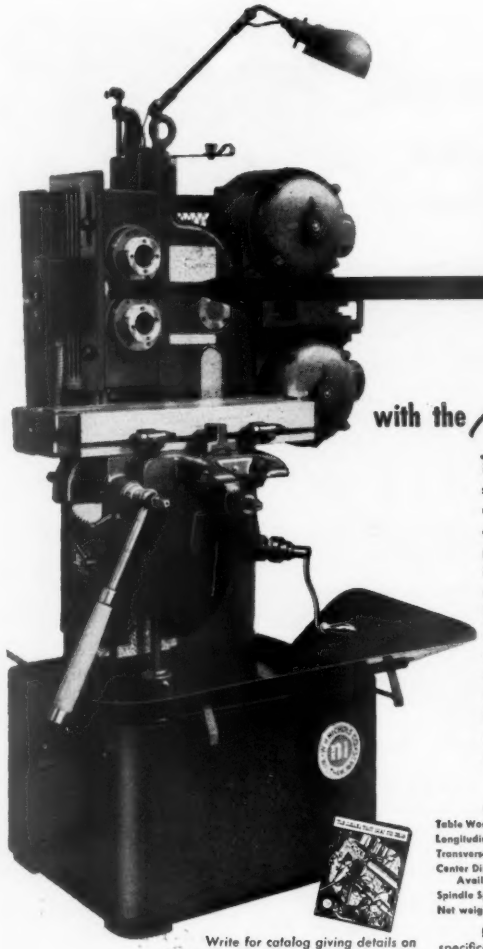
P.S. *You still enjoy Benchmaster dependability and economy on the Back-Geared Models!*

Internal Gear Finisher for spur and helical gears is described in new bulletin 870-C-52 from Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Michigan. Either transverse or plunge shaving to 12″ OD.
Circle Inform-A-Gram No. B159.

Big Cutter Selection is presented in latest catalog from Apex Tool & Cutter Co., Shelton, Conn. Multiple and single point bits with round or serrated shank; end mills; combination boring and facing mills; alternate angle cutters featured.
Circle Inform-A-Gram No. B160.

Inexpensive Drilling Various Shaped Holes is explained in current bulletin from Watts Bros. Tool Wks., Wilmerding, Pa. By this system square, triangular, pentagonal and hex and octagonal holes may be drilled.
Circle Inform-A-Gram No. B161.

Black Granite Surface Plates by Rahn Granite Surface Plate Co., 641 N. Western Ave., Dayton 7, Ohio have accuracy of .00005″, are warp, rust, and bump free. Data on these and other items in a line of basic measuring equipment now available from maker.
Circle Inform-A-Gram No. B162.



TWO FOR ONE
with the *Nichols* Double-Decker!

The Nichols "Double-Decker" Two-spindle Miller actually gives you two milling operations in one pass! It is equally adaptable to small or large lot production of small parts where parallel flats or grooves, or opposed faces cannot be straddle milled, or otherwise must be indexed for two operations with a single cutter. Its time-saving features are readily apparent. Spindles may be separated from 4" to 7" (or more) to accommodate various sizes of cutters and work. Table can be arranged for hand operation or with automatic work cycle, and with high or low spindle speeds.

CONDENSED SPECIFICATIONS

Table Working Surface	6⅛" x 21"
Longitudinal Travel	10"
Transverse Travel	7"
Center Distance of Spindles Available Between	3¾" and 14⅜"
Spindle Speeds Available	up to 5000 R.P.M.
Net weight approx.	1250 lbs.

Write for catalog giving details on lever, screw and air-feed models, plus three types of double spindle Nichols Millers.

Inquiries must be submitted in detail, as specifications and capacities are governed by user's needs.

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION 76-X MAMARONECK AVE. WHITE PLAINS, N.Y.

Bench Model Bending Brake by Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill., bends sheet metal to 18 gauge—24″ long. Positive cam action clamp, stop for duplicate accuracy.
Circle Inform-A-Gram No. B163.

New Type Pilot Bearing Bushing provides absolute seal against grit and dust. Cartridge type design of bearing holder offers accuracy, protects both against thrust and radial loads, offers great support due to overall bushing length. J. G. Jergens Co., 11106 Avon Ave., Cleveland 5, Ohio.
Circle Inform-A-Gram No. B164.

"Engraving Machines and Accessories" is title of color brochure from H. P. Preis Engraving Machine Co., 282 Industrial Branch, Hillside, N. J. Four different styles are featured. One full page devoted to cutters.
Circle Inform-A-Gram No. B165.

Light Wave Tolerance Tested, the complete line of drill bushings by Ace Drill Bushing Co., Inc., 5405 Fountain Ave., Los Angeles 27, Calif., are described in literature now ready.
Circle Inform-A-Gram No. B166.

Electronic Production Gage described in bulletin 103 from Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio is designed for repetitive dimensional gaging on long or short run or toolroom work, gives linear readings in fractions of an inch. Twin amplification.
Circle Inform-A-Gram No. B167.

100% Forced Convection Heat Treating Units are discussed in a new bulletin just issued by Ipsen Industries Inc., 715 S. Main St., Rockford, Ill. Fully illustrated, complete specifications.
Circle Inform-A-Gram No. B168.

Plug, Ring, and Pipe Thread Gages are featured in a new hard bound 36 page catalog from Cadillac Gage Co., 20316 Hoover Rd., Detroit 5, Michigan. Plus features include interesting section on a series of "Pla-Check" gages, special gages and useful pages of dimensional and gage tolerance tables.
Circle Inform-A-Gram No. B169.

Instruction in Sawing is contained in the handbook of metal sawing from W. O. Barnes Co., Inc., Detroit 14, Michigan. Numerous charts, graphs and tables of assistance to users and purchasing agents given.
Circle Inform-A-Gram No. B170.

Special Accuracy Standards for faultless assembly are boasted by "Safety Plus" socket screws in standard sizes from Chicago Screw Co., 2519 Washington Blvd., Bellwood, Ill. Socket, cap and set screws, nuts, taper pins and studs all described in current literature.
Circle Inform-A-Gram No. B171.

High Speed Extra Long Drills, specials at standard prices, are featured in the stock listings of Victor Machinery Exchange, Inc., 251-P Centre St., New York 13, N.Y.
Circle Inform-A-Gram No. B172.

Wiring Diagrams, Design and Construction Detail, and specifications on the Bellows air motor cylinder are given in bulletin CL-30 from the Bellows Co., Akron 9, Ohio. Helps simplify selection.
Circle Inform-A-Gram No. B173.

Precision Holes in C-40 to C-68 Rockwell Steels may be quickly drilled without annealing danger with "Hi-Rockwell" drills from Champion Tool Co., Box 463, Farmington, Michigan. Drills dies and molds after hardening.
Circle Inform-A-Gram No. B174.

Special HSS and Carbide Cutters for a wide application range are made by National Tool Salvage Co., 6511 Epworth Blvd., Detroit 10, Michigan, whose complete catalog is now available to readers.
Circle Inform-A-Gram No. B175.

Featherweight Air Grinders described in 20 pager from Madison-Kipp Corp., 212 Waubesa St., Madison 4, Wis. Accessories also covered include mounted grinding wheels, cutters, tool post adaptors.
Circle Inform-A-Gram No. B176.

Grip-Master Fixture Lock is easily adjusted to jig requirements, gives positive locking in a single motion. Details from National Tool Company, Dept. 132-D, Racine, Wis.
Circle Inform-A-Gram No. B177.

Grobet Chatterless Countersinks have special staggered cutting edge design. Full data is contained in catalog AC1 from the Grobet File Co. of America, 421 Canal St., New York 13, N.Y.
Circle Inform-A-Gram No. B178.

Square, Hex, Crescent, or any other desired hole shape may be cut in any metal of any thickness with the M-300 Electron Drill by Elox Corp. of Michigan, 602 N. Rochester Rd., Clawson, Michigan. Full performance data available.
Circle Inform-A-Gram No. B179.

Time Saving Fixtures and Bars are typical of tooling described together with services, facilities and equipment in current catalog from Bunell Machine & Tool Co., 1600 E. 24th St., Cleveland 14, Ohio.
Circle Inform-A-Gram No. B180.

Cost Cutting Rotary Files, countersinks, high speed cutters and tube deburring files are made by Beaver Cut Rotary File Co., 119 E. 23rd St., Los Angeles 15, Calif.
Circle Inform-A-Gram No. B181.

For Heavy Cuts, Close Tolerances and Surface Finish it's difficult to beat the #3B surface grinder from Abrasive Machine Tool Co., 16 Dunellen Rd., E. Providence 14, R.I. Bulletin now ready.
Circle Inform-A-Gram No. B182.

Eliminate Heating Power Waste! "Temcometer" literature tells of new device to control power supply to furnaces, ovens, melting pots, and other electrical heating devices. Thermo Electric Mfg. Co., 474 Huff St., Dubuque, Ia.
Circle Inform-A-Gram No. B183.

Wide Range of New Machine Tools as well as small precision tools and measuring equipment of both American and European manufacturers is contained in new 24 page catalog from De Witt Equipment Co., 136 Lafayette St., New York 13, N.Y.
Circle Inform-A-Gram No. B184.

Complete Set of Scaled Templates, detailed eng'g drawing, and generous illustrations are plus features of latest catalog describing "Kwik-Klamps" for all work-holding and fixturing operations. From Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50
Circle Inform-A-Gram No. B185.

Jig Boring and Cam Milling Service is offered by the Eisler Eng'g Company, 753 S. 13th St., Newark, N.J. Also special contract production, development and experimental work.
Circle Inform-A-Gram No. B186.

NEW T-J Spacemaker AIR CYLINDERS

CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

- SAVES UP TO 40% SPACE WITH NEW STREAMLINED DESIGN.
- SUPER STRENGTH . . . EXTRA HIGH SAFETY FACTOR
- SOLID STEEL HEADS
- HEAVY WALL, PRECISION HONED, HARD CHROME PLATED, SEAMLESS STEEL BODY
- LEAKPROOF CYLINDER HEAD TO BODY CONSTRUCTION.
- RELATIVE PORT POSITIONS MAY BE ROTATED WITHOUT DISASSEMBLY OF CYLINDER AND LOCKED IN DESIRED POSITION.
- HEAVY DUTY, HI-TENSILE, HARD CHROME PLATED PISTON ROD.

Streamlined construction of the new T-J Cylinders *eliminates tie rods . . . reduces head size . . .* and *saves up to 40% in mounting space!* In addition, a new high in strength is achieved with solid steel heads and heavy wall seamless steel body . . . leakproof construction . . . extra high safety factor.

Cylinder walls are precision honed and hard chrome plated for long-life efficiency. Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . both cushioned and non-cushioned . . . for wide range of pushing, pulling, lifting, clamping or control jobs. T-J dependability. *Fast delivery* to meet rush requirements. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.

37 YEARS EXPERIENCE

Many More Advanced Features!

T-J TOMKINS-JOHNSON
RIVETORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

. . . Wheel Preparation, from page 91

A wheel which vibrates after it has been carefully dressed should be discarded.

After a "clean" sharp wheel is obtained, the operator may determine that rapid removal of material is paramount and finish secondary. He can, therefore, omit the finish dress on the wheel or take another deep cut (.001" to .002") at a fairly rapid crossfeed. This leaves a spiral groove and accompanying spiral ridge in the wheel face thereby providing a deep gullet for rapid stock removal and a more effective cutting surface as afforded by the ridge.

Form Dressing With Diamonds

Essentially, the same general principles apply to form dressing with diamonds as were described for flat dressing.

Truing and Flat Dressing By Crush Method

Crush rollers can be used to true and flat dress the wheel, Figure 8. When this method is used, however, it is best to make certain that the spindle is sufficiently rugged and the column stable. Pressure should be carefully applied and should not be excessive. For truing and flat dressing, however, the diamond is generally recommended since it is easier to use and does not cause too great a pressure to be applied to the spindle. The crush method is generally employed for form dressing where time is saved since the desired form is evolved directly from the pre-formed steel rollers.

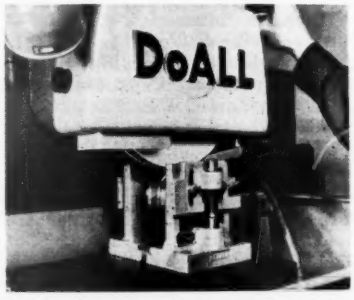
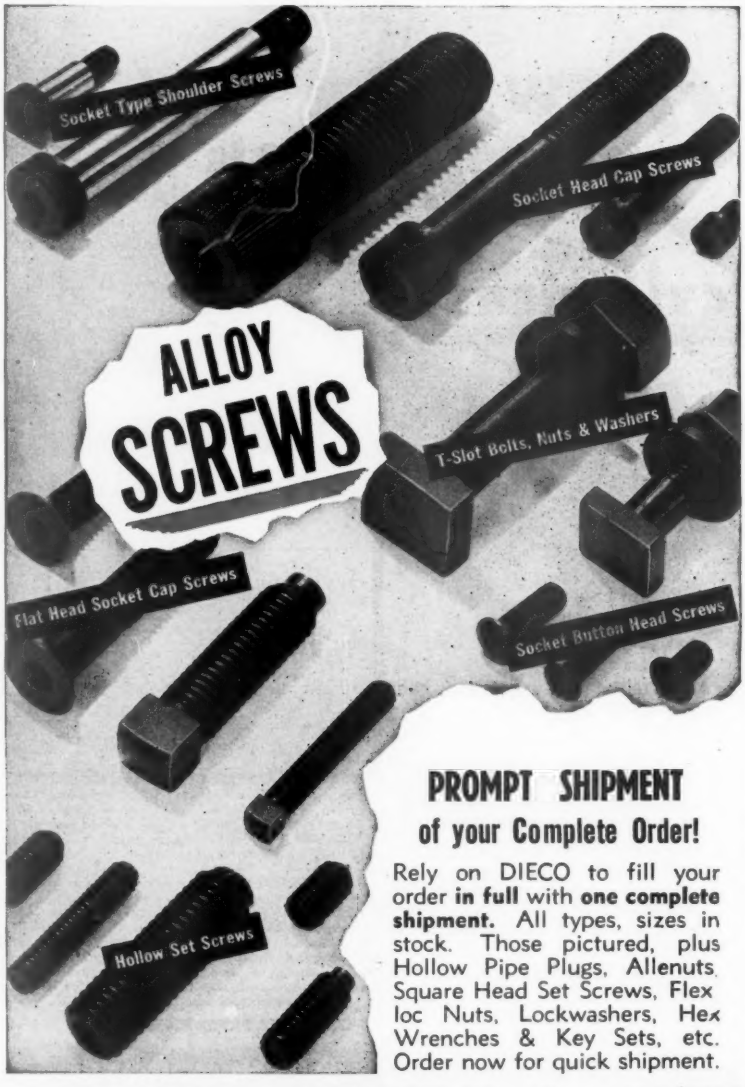


Fig. 8. Demonstrating a crush dressing operation. Adjustable crush roll idler stand is used here. It carries the formed steel roller which crushes the wheel to the desired shape.



PROMPT SHIPMENT
of your Complete Order!

Rely on DIECO to fill your order **in full** with **one complete shipment.** All types, sizes in stock. Those pictured, plus Hollow Pipe Plugs, Allenuts, Square Head Set Screws, Flex loc Nuts, Lockwashers, Hex Wrenches & Key Sets, etc. Order now for quick shipment.

The DIE SUPPLY Co.

CLEVELAND 9: 1400 Brookpark Rd. ★ SHadyside 1-9000 ★ TWX-CV-202 ★ LI-122
PITTSBURGH 6: 122 S. Sheridan Ave. ★ EMerson 1-0440
DAYTON 4: The Die Supply Sales Co., 311 Vermont Ave. ★ MI. 9691 ★ TWX-DY-85
BUFFALO 1: Die Supply Corporation, 234 Carolina St. ★ MAdison 1964

DIECO

"Eyesaving" at G. E.

A "pistol" which shoots steel "bullets" is helping protect the eyesight of employees at the General Electric Company.

The gun is part of a unique "eyesaver" unit used to point out the effectiveness of safety glasses to employees of the Company's large Steam Turbine and Generator Department.

Mounted at one end of the "eyesaver" unit, which is about the size and shape of an ordinary shoe box, the gun fires a steel ball at a pair of eyeglass lenses at the other end of the box. They shatter, but a safety glass pair are not affected.

The value lies in the dramatic manner in which it shows the sharp splinters and glass dust which cause serious injuries when an ordinary lense is broken.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

. . . Foreman Training, from page 59

Let's run that production department like a small business with each foreman the proprietor and yard-stick of his ability the profit or loss he produces against a sound operating budget. Let's give him back his authority. Let's let him have the authority to accept or reject the advisory functions and service facilities provided him since he is charged with these services anyway and they seriously affect his costs.

What happens, you say, if those twenty scheduled pieces mentioned above mean keeping or loosing an important account and the foreman rejected the request to schedule the job today. The scheduling department is responsible to the plant manager even as the foreman is, and a direct order through the line of authority from plant manager to the foreman would solve the problem and save the account, but responsibility would be fixed. If an error of scheduling, it could be attributed to scheduling and at least an undesirable inefficiency would be pinpointed with responsibility fixed and recognized by everyone involved.

In like manner, since these advisory and service functions are in existence to provide help to the foreman and his production department, and since the production department is charged with its share of their costs, our foreman has the right to go to his superior to get these staff departments to perform for him as he requires in order to earn greater profits and at the right cost.

You might ask, just how do you go about training foremen in your philosophy, Mr. Sheppard? The first step is to obtain all the reports the foremen get or are supposed to get from factory accounting, timekeeping, scheduling, personnel, etc. In addition, we gather samples of all the reports sent to other operating personnel or executives. We then digest and analyze these reports to find out what facts are contained that the foreman can use in determining daily production, quality, performance and cost in the operation of his department.

Then foreman group meetings are scheduled. Our foreman training subject is introduced to the foreman by explaining to them how important their executive functions really are. We impress on all the foremen that their departmental operations are the only real productive activities and that it is essential these activities be performed at a profit. We explain our philosophy of advisory staff functions and service activities. We explain how all these functions are charged to their departments and how the foreman in effect buys these services and has authority to accept or reject them based on his own decisions.

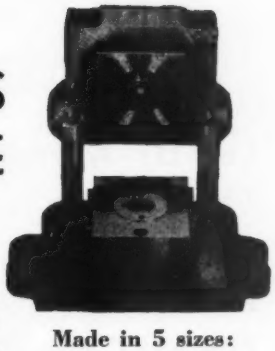
We explain that our philosophy of foreman responsibility involves giving back to the foreman full authority and decision in his own department. We tell the foreman that he is in effect a small businessman with all the responsibility and authority for producing a profit in his department.

We explain the reports he receives and those sent to his superiors. We show him how the facts exhibited by these re-

. . . *Continued on page 112*

"A MUST wherever WASHERS are made!"

HOVIS OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD



There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

Made in 5 sizes:

¾"—1½"—2½"—4"—6"

Write for literature.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Phone: Slocum 7-4800

VAN DYKE, MICHIGAN
Suburb of Detroit

MEN YOU SHOULD KNOW . . . . . .

Harry W. Schlentz

William H. Roberts

William C. Davidson

Dwight A. Bessmer

Fred Rimmler

Harry W. Schlentz is in charge of a new sales office recently opened by the Boyar-Schultz Corporation at 2462 East Slauson Ave., Huntington Park, Calif. The branch will carry a complete stock of the company products, and will serve the Los Angeles industrial area and surrounding territory.

Detroit Stamping Company has announced the appointment of William H. Roberts as vice president and secretary. Over the last fifteen years he has served the company in various capacities in the administrative department, was made manager of the finished products division in 1945.

William C. Davidson has been appointed abrasive engineer for the West Virginia territory according to a recent announcement from Norton Company. Formerly instructor of human relations in the sales training department, he is a registered professional engineer in the state of Ohio.

Directors of Timken Roller Bearing Company recently elected Dwight A. Bessmer a vice president of the company. Bessmer has been with Timken since 1933, when he entered the industrial division. He was a service and sales engineer before becoming director of purchases in 1940.

Fred Rimmler has been appointed plant manager of John Volkert Metal Stampings, Inc., Queens Village, Long Island, N. Y., manufacturers of precision stampings for the electronics and electrical industries. He has been with the company since 1949, was formerly associated with RCA Victor Mfg. Company, Inc.

120% INCREASE
IN PRODUCTION
With Less Manpower

D.P.S.
Motorized
HOPPER
UNIT

PICKS 'EM UP & LAYS 'EM DOWN IN EXACTLY THE RIGHT POSITION

Let Us Adapt This Precision SELECTIVE FEEDING DEVICE To Your Individual Needs

Send us your feeding problem . . . Tell us where you want it . . . How fast you want it . . . and in what position you want it . . . AND WE WILL PUT IT THERE FOR YOU.

See how these hoppers are adaptable to all types of production machines.

WRITE FOR OUR MOST RECENT CATALOG

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

. . . . . MEN YOU SHOULD KNOW

John P. Sweeney

H. Thomas Hallowell, Jr.

Russel L. Gergen

Gordon M. Sommers

Werner I. Senger

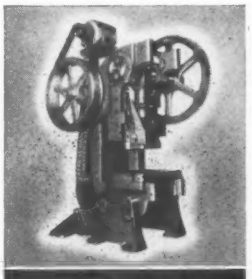
Firth Sterling Inc. announces the appointment of John P. Sweeney as district manager of the Detroit branch. He succeeds Gunther A. Jacobs. Before joining the company in 1950, he was president of J & T Hurley Inc. for ten years, and subsequently a manufacturer's representative in industrial equipment.

H. Thomas Hallowell, Jr., 44-year-old president of Standard Pressed Steel Co., Jenkintown Pa., has been named to receive the 1952 Achievement Award of the National Metal Trades Association for an outstanding contribution in the field of industrial relations. He is the fourth to get the award.

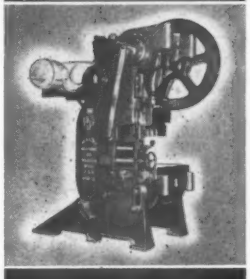
Pipe Machinery Co., Cleveland, Ohio, announces the appointment of Russel L. Gergen as sales manager of the Gage Division. He has been with the company for twelve years in various capacities, and before joining them was associated with the U. S. Aluminum Corporation of America.

Gordon M. Sommers was recently announced manager of its Hamilton, Ohio, plant by the Clearing Machine Corporation. He is responsible for the design of all presses and auxiliary equipment at the division, which include inclinable, horning, and other power presses from 30 to 200 tons capacity.

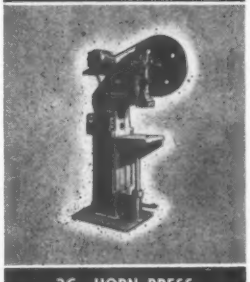
Werner I. Senger was recently elected vice president in charge of Balancing by the Gisholt Machine Company. He has been with this concern for over 35 years, in charge of balancing machine development and engineering since 1924. He is recognized as a leading authority in this field.



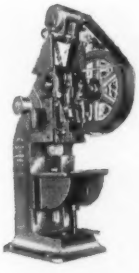
#700 B GEAR PRESS



650-B PLAIN FLY WHEEL

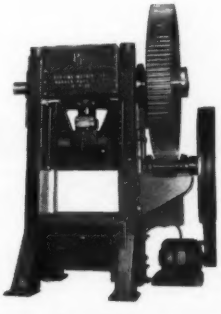


3G HORN PRESS WITH ADJUSTABLE TABLE



No. 55G WITH ADJUSTABLE BED PRESS.

Illustrating a few of the many types and sizes of standard Perkins Presses. Presses built to customers' special specifications.



No. 12-H-36 STRAIGHT SIDE, SINGLE CRANK TIE-ROD CONSTRUCTION PRESS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

. . . Foreman Training, from page 109

ports can be interpreted and used to guide his daily decisions and operations.

We then throw each meeting open for foreman questions and answers. Here are a few typical foreman questions and how we answer them.

QUESTION: When an inspector says that a piece won't pass and tells me to shut down the machine, am I obliged to do as he says?

ANSWER: Certainly not. Inspection is an advisory function to your department. Yours is the authority and decision to follow inspection's recommendation or not. But remember this. It is your authority as foreman to decide, but whatever your decision, the responsibility must rest squarely on your shoulders. To arbitrarily refuse the inspector's recommendation and to continue to produce faulty pieces that would result in scrap would result in departmental losses with the responsibility yours. Either the inspector or the foreman may appeal to higher authority whenever they cannot come to a mutual understanding of what is to be done.

Recently this same question came up in a plant with which we are familiar and the foreman refused to follow the same recommendation of inspection based on these facts: (1) inspection had more rigid standards than the customer; (2) the customer had previously accepted as satisfactory the same pieces that inspection was recommending be scrapped. In this situation the foreman refused inspection's request and saved considerable production that would otherwise have been lost and which would have reduced department profits. In this instance responsibility was pinpointed to inspection and quality standards were revised.

QUESTION: Can the foreman run more pieces than the production order calls for?

ANSWER: No. The foreman's only authority on how much to produce is the production order. Sales and quantities are not his responsibility and he has no authority for running more or less than the production orders call for.

QUESTION: Is the foreman required to accept whatever new employees the employment department sends him?

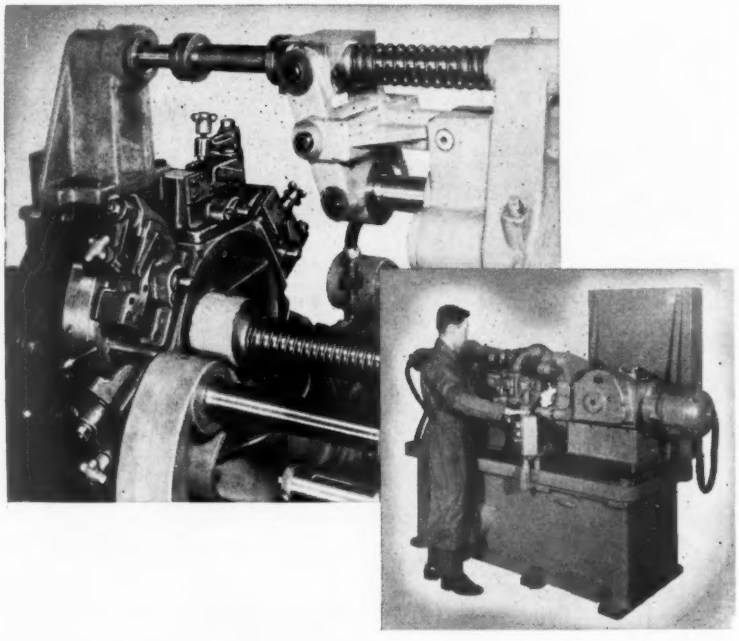
ANSWER: Certainly not. The employment department is an advisory staff function but the foreman has the authority to accept or reject new personnel. An intelligent foreman like a good small businessman will insist on appraising any new personnel assigned to him as the productivity of each worker directly affects his profit or loss.

QUESTION: Is the timekeeper the final authority on where a workman used his time or is the foreman the final authority?

ANSWER: The foreman is the final authority. He should make a practice of checking the accuracy of the timekeeper reports on all his men as these reports are the basis of figuring departmental labor costs. In actuality, the timekeeper is no more than an acting clerk of the foreman.

QUESTION: What should the foreman do when material is not brought to his department on time?

ANSWER: Raise hell. Material handling is a service function which the production department buys and is charged with.



Showing Practical Application of WESPO Parts by Large Machine Tool Builder

The use of WESPO swing clamps as an integral part of a special machine designed and produced by Hartford Special Machine Co. is an indication of the tendency of design engineers and tool engineers to standardize on WESPO clamps and components.

The nation-wide use of WESPO clamps and components is due not only to the practical design of WESPO clamps and components, but, also, to their effectiveness in work-holding and their economy. Engineers have found that the use of WESPO components saves them up to 70% in fixture cost. Write for catalog of 15 different type clamps in 100 sizes and over 350 component parts.

WEST POINT MANUFACTURING CO.
26935 W. SEVEN MILE ROAD • DETROIT 19, MICHIGAN

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Failure of material handling to have material in the department on time causes waste of man-hours, idle machines and loss of production and profits. Failure of service functions to perform for the foreman as required should be brought out into the open and the failure pinpointed and corrected.

QUESTION: When the tool room fails to sharpen a tool or a tool isn't ready to run or a tool wasn't properly made and fails to work in the machine, what should we do?

ANSWER: Insist that the ensuing delay and loss of time and production be charged against the tool room. Let tool room's failure be pinpointed and refuse to accept charges for these delays or tool failures. In effect you are buying service from the tool room. This service is costed against your department profit and like any other good businessman, refuse to pay for service you did not get or tools that did not work.

Conclusion

Apply this concept of returning to the foreman his inherent functions, and returning his responsibility for performing them at a profit in the operation and control of his part of a manufacturing business. Soon every key person will get a new perspective of his own place in the enterprise. Staff technicians, service supervisors, engineers, accountants and department foremen will begin to look upon their jobs in relation to their contribution to the profits of the company.

When this happens, a new sense of balance and of values will develop and the whole organization team will take on purpose and direction resulting in more efficient production at lower cost.

A good example of such an event is illustrated by our experience with one of the leading rubber companies. While we were developing departmental budget controls it was brought out that responsibility for maintaining and changing over equipment rested with the chief engineer of the plant and not with production department foreman or superintendents.

The fact that costs were being analyzed led the chief engineer to make his own investigation and to give production department supervision full information on what maintenance was costing in relation to production volume.

With more knowledge of the cost of maintenance, more rational requests for maintenance service, rejection of all unnecessary maintenance service and a careful check of the time and materials used by maintenance men in making essential repairs, the startling reductions in the cost of maintenance took place which are shown in the accompanying tabulation. (See page 59).

This amounts to a reduction in maintenance expenditures of over **$15,000 per month** or about a 40 per cent drop from the year before. It was done by applying sound business-like methods to internal departmental affairs just as the company has long been noted for doing in its external relations with is vendors and its customers.

The correct approach to foreman training is a true business approach, taking foremen out of

. . . *Continued on page 169*

NEW

INDIVIDUAL VULCANAIRE DUST COLLECTING UNITS

Are used on surface and other grinders where grinding dust must be removed.

Inexpensive, compact units, with no moving parts. Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

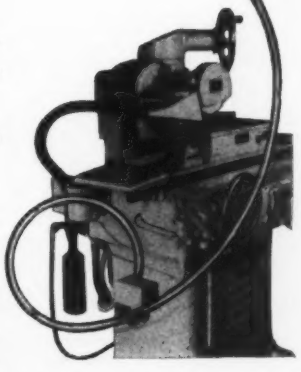
Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. This mounting permits constant contact with dust as the wheel is moved up or down.

A simple needle valve operates the unit, and can be shut off whenever the machine is not in use.

Available in two sizes: 700 series for grinding wheels 7" dia. or less—200 series for wheels 2" dia. or less.

Made by the makers of Vulcanaire *The* jig grinding attachment.

Write on your letterhead for "Dust Collector" Booklet.



VULCAN TOOL CO.

PRITZ ST., DAYTON 10, OHIO

. . . Maintenance, from page 93

costs of the job and posts these charges on the Equipment Record sheet for the specific equipment on which the work was done.

Work orders are made out in duplicate, both copies being submitted to the maintenance office. If a production supervisor making out the work order desires a copy for his file, he makes out the order in triplicate, retaining the third copy. Upon receipt of the work order, the maintenance clerk stamps a work order number on both copies; the original copy is retained in the maintenance office for follow-up, and the duplicate copy is assigned to the maintenance personnel.

Standing work orders have been developed for all of our plants and are used to eliminate the necessity for repeated issuance of individual work orders for routine maintenance work done at regular intervals. They cover routine maintenance, machine adjustments and repetitive jobs such as replacement of fuses, light bulbs, lubrication, equipment cleaning and other items of this nature that are not assigned individual work orders.

Maintenance Time Cards. Maintenance time cards were developed to tie in directly with our entire preventive maintenance program. Spaces are provided for the mechanic's name, clock number, work order numbers, nature of jobs assigned, regular hours and overtime.

Our work orders indicate the maintenance labor expended on regular jobs, however, the maintenance time card is our only record of the maintenance labor expended on standing work order numbers and special work not covered by any individual work order.

Storeroom Withdrawal Order. The success of the maintenance department depends greatly upon having a storeroom with sufficient quantities of spare machinery and equipment parts and maintenance supplies.

Storeroom withdrawal orders are used by all of our mechanics for obtaining equipment parts and supplies from the maintenance storeroom. The parts are priced from data on the perpetual inventory, and the withdrawal order is then passed on to the maintenance clerk who attaches it to the work order for which the material is to be used. Upon completion of the work order, all storeroom withdrawals charged to that order are summarized to obtain total material cost.

To know what parts to stock we were guided by past experience, manufacturers' recommendations, market conditions and our production schedules. The investment in parts and supplies is so great that proper

A MOVABLE HORIZONTAL SURFACE
for YOU
UP
. . . . . REMOVE
PORTELVATOR®
(The Handy Hamilton Portable Elevating Table)
DOWN
FETCH . . . . .
● In hundreds of spots throughout your operation you are required to lift or lower, take or fetch. Tools and dies must move from storage to machine—from machine to storage. Materials must be positioned. Machines must be fed.
Consider this fact! You can accomplish many industrial movements better and cheaper with Portelvator, the handy Hamilton portable elevating table, than with any other means or device regardless of cost. Take another look at your operation, then take a look at the exclusive mechanical lift principle which is employed in all Portelvator applications. Write for free bulletin P-5309.
●
Portelvator® employs an exclusive mechanical lift principle based upon power transmission through meshing worm, worm gear, and screw. Load capacities to 20 tons. Stationary or portable. Power operated or manual. Push button controlled or completely automatic. Vertical movement to 10 ft. Table sizes to suit requirements. Tilt tops. Flat tops. Roller tops. — Take another look at your operation . . . and at Portelvator. Write now!
THE Hamilton TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

stores' records and control are very necessary; perpetual inventory of all items carried, and the use of withdrawal orders, therefore, are important phases of preventive maintenance.

It is essential that a sufficient quantity of spare parts and materials be carried in stock, yet it is necessary not to have too much money tied up in maintenance inventory above the actual operating requirements.

Monthly Report of Preventive Maintenance Inspections. Any program, to be effective, must be checked periodically to determine whether it is functioning properly. This is especially true of multi-plant maintenance operations administered from a central office.

We developed a form as a check list to be prepared monthly by the maintenance clerk and submitted to the manager of the mechanical division. The summary of inspections scheduled, inspections completed, inspections incomplete, critical points found, jobs resulting and jobs completed is compared, month by month. If the preventive maintenance program is functioning properly, it will be evidenced by a gradual decrease in jobs resulting from the scheduled inspections.

Mechanical Downtime Report. One of the best measures of the effectiveness of a sound preventive maintenance program is the reduction of mechanical downtime.

Formerly, some of our plants kept a log of breakdowns and they used this data for planning improvements and determining where weakness existed in a particular production department or on specific equipment. From this, our Mechanical Downtime Report was developed to give our maintenance mechanics a uniform way in which to report machine and equipment downtime to the maintenance office.

Each mechanic carries a few mechanical downtime report forms with him and makes one out when there is a shutdown due to mechanical failure during a scheduled production period. He indicates the shutdown duration for each production unit affected.

The data listed on the Mechanical Downtime Report is reviewed daily to determine whether the cause of the breakdown was due to poor workmanship, faulty material or other causes; and, an effort is made to avoid a repetition of the failure. The data also is subject for review at the weekly plant maintenance meeting.

As mechanical downtime records are accumulated, it may

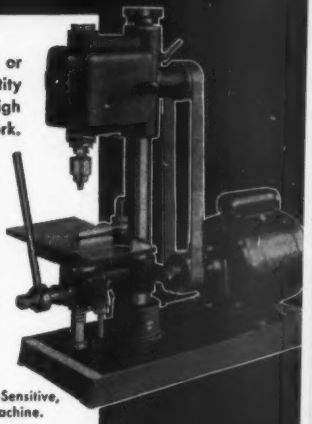
. . . *Continued on page 118*

YOU CAN DRILL OR TAP TINY, PRECISION HOLES . . . ON A PRODUCTION BASIS . . . WITH MINIMUM SCRAP AND MINIMUM TAP AND DRILL BREAKAGE

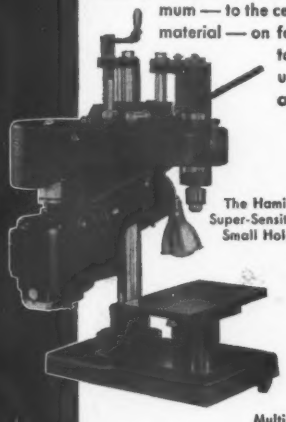
BUT YOU MUST FIT THE TOOL TO THE JOB

When your job calls for tiny, precision holes, drilled or tapped, rely on this; such holes can be produced in quantity and within allowed tolerances only on super sensitive, high precision machines designed and built for this class of work.

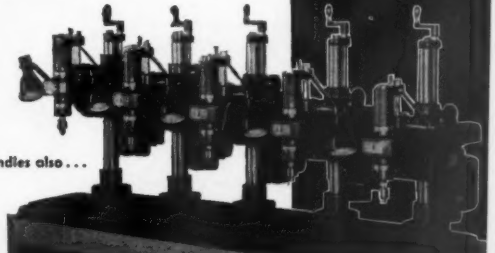
HAMILTON Drilling Machines and Tapping Machines are super sensitive and extra accurate; designed and built for the production of tiny, precision holes. The drilling machines produce holes up to 0.3125" maximum — to the center of 10" — in any drillable material — on fast production schedules. The tapping machine is designed to use the smallest and finest tap and up to 10-32 inclusive.



The HAMILTON® Super-Sensitive, Small Hole Tapping Machine.



The Hamilton VARIMATIC® Super-Sensitive, Variable Speed, Small Hole Drilling Machine.



Multiple spindles also . . .

Acquaint yourself with Hamilton Super Sensitive, Small Hole Drilling and Tapping Machines and be ready for the challenge ahead. Ask for our FREE Bulletin DT-5308.

THE Hamilton TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Quality Control — The Air Force — Korea

U. S. Air Force Equipment arriving in Korea today is of higher quality than ever received before —thanks to a modernized and more highly effective industrial inspection system instituted by Air Materiel Command.

Quality control today is a far cry from the system used during World War II. At that time as many end items — 100 percent if possible — were checked as available manpower would permit. Now it is the responsibility of the contractor to maintain control of quality at or above minimum Air Force standards. It is the duty of the Air Force control man to survey the contractor's inspection system and verify his inspections to make sure that the quality does not drop below requirements.

The Air Force man verifies the company inspectors' reports on raw material, or parts that go into the product; on the calibration of tools and gages; on special processes, such as heat treating, plating, welding, etc.; on the systems used to get drawing changes to the inspectors; on packaging; and on preservation.

Thus, the Air Force man works with the contractor from the time raw material is received until the final product is completed, instead of just "checking quality at the end of the line". This close relationship enables the contractor to locate and correct discrepancies as they occur and assures him and the Air Force that the final product will meet specifications.

This new concept is known as the "Surveillance" type of quality control.

Experts have been singing the praises of the new system. Inspection by surveillance, they say, not only provides better quality assurance, but can be accomplished with fewer persons. This is mainly due to the elimination of the tremendous duplication of effort which existed when Air Force inspectors spent most of their time repeating the same inspections and tests already performed by the contractor.

The procurement inspection force has consequently been reduced from 14,000 during World War II to 4,000 today. Not only are these 4,000 Quality Control personnel doing a more effective job, but they are handling a larger workload than their 14,000 predecessors.

The backbone of the new system is the inspector himself. He must combine job knowledge with the ability to understand and analyse the contractor's manufacturing and quality control system. In order to help Air Force personnel to do a better job, a 10 week course in nine phases of quality has been conducted at the Pittsburgh Technical Institute at Air Force expense.

The nine phases of the course are: quality control administration; combination of blue print reading and shop methods; materials and processes; tool gages and instruments; packaging, receiving, and preservation; statistical quality control; familiarization on aircraft instruments and equipment, on airframes and engines; and basic electricity.

Though the inspector is the backbone of the system, his work is verified, just as he verifies that of the company inspector. Once or twice yearly a survey team inspects his system and verifies his findings. As does the inspector, the survey team makes physical inspections of the various phases of manufacture and compares its findings with his.

Those Who Know Best

Buy JOHNSON BAND SAWS

Best Value for the Money — Best Performance

Engineers and Master Mechanics appreciate the plus-value of Johnson Saws . . . the dual frames mean accurate cutting and maximum blade life . . . the 3-point suspension eliminates twisting . . . the heavy axles, etc., all mean one thing to the engineer—VALUE

MODEL J pictured . . . Cuts 10" rounds, 18" flats. Available as a wet or dry cutting machine.

MODEL B also available, a smaller machine . . . Cuts 5" rounds, 10" flats; furnished with or without casters. Really portable. Can be taken anywhere for on-the-job cutting.

There is a Johnson Dealer near you

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

Statistical Sampling for Aircraft Engines

A statistical sampling plan for aircraft engines is saving you millions of dollars annually with no reduction in safety or quality.

The plan is based on the fact that even 100 percent inspection involves some small risk that a defective engine will be accepted. This has been long recognized. Quality Control (inspection) at Air Materiel Command therefore set up the sampling procedures which permit inspection of only a portion of the engines without increasing the risk of accepting a defective one.

In one facility, annual savings amounted to 69,000 manhours, 1,134,000 gallons of fuel for tests, and reduction in the use of engine test cells and facilities, all totalling approximately $450,000. Comparable results are being obtained at other plants.

For a long time, one of the most costly and time-consuming procedures has been the acceptance testing of aircraft engines. Until recently, when the Air Force developed a streamlined acceptance plan, it had been standard practice to run all newly built engines in a test cell for about two hours.

The engine was then taken apart and the parts inspected for signs of excessive wear. The contractor would correct any defects and the engine was assembled and run for two more hours. If the final test showed that the engine met all the performance characteristics, the Air Force inspector accepted it.

The expense of this system is apparent. Besides the time consumed, it required test cells to run every engine twice, men to operate the cells and inspect the engines, and quantities of fuel.

Basically, the new plan adopted by the Air Force provides for a reduction in the number of engines given a second inspection. After an initial qualification period, during which the manufacturer demonstrates that he is producing at a satisfactory quality level, the disassembly and testing of all the engines is reduced to one-half the number, one-quarter or one-tenth, based upon the quality level which the engine manufacturer is maintaining.

This quality level is determined from those engines which are disassembled and retested. All engines, however, continue to be completely tested for performance characteristics at least once.

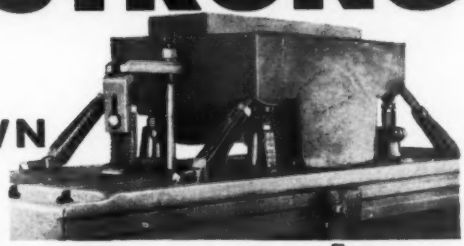
The plan is modeled on Dr. H. F. Dodge's continuous sampling plan, in which the risk is called the outgoing average quality limit. The Air Force's plan, however, is a triple level plan providing for reductions to the fifty, twenty-five or ten percent inspection rate based upon the manufacturer's established quality level.

This new statistical sampling plan for aircraft engines is not a rule of thumb. It is a statistically sound sampling plan which shows the Air Force inspector whether the manufacturer is producing engines of the specified quality. If the engines are of lower quality, the plan assures that the contractor will immediately revert to larger samples or return completely to one hundred percent inspection until the quality improves.

According to Air Materiel Command the plan was conceived in 1951 and has been in operation since the end of that year. It ties in with the concentrated effort now being made to obtain more production, better quality and lower cost in supplies being bought for the Air Force, still maintaining the highest quality standards.

ARMSTRONG

SET-UP and HOLD-DOWN TOOLS



PLANER JACKS

NON-SKID JACKS

STEP BLOCK

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

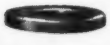
Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

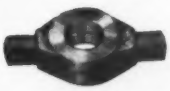
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

T-SLOT CLAMP

UNIVERSAL CLAMP



T-SLOT BOLTS AND NUTS



STRAP CLAMPS

. . . Maintenance, from page 115

become evident that a particular production unit is constantly in need of repairs and adjustments. If the cause for these repairs and adjustments can be eliminated by overhauling the unit, arrangements are made for a scheduled shutdown of the unit so that all necessary repairs can be made at one time.

Personnel Required

At this time of scarcity of qualified maintenance personnel, the emphasis should be on training and using your present personnel to install and administer a preventive maintenance program.

The entire concept of preventive maintenance must be sold to the mechanics; the idea of preventing breakdowns must supersede the idea of their being standby men, ready only to repair breakdowns quickly and then await the next breakdown.

Preventive maintenance inspections can be used for building up the knowledge and ability of all mechanics by rotating their assignments. These inspection assignments can be used also for training plant engineer trainees.

In the planned preventive maintenance program, the so-called extra help for the plant engineer would be a combination maintenance clerk and maintenance storeroom keeper for the small plant or separate clerks and storeroom keepers for large plants. These clerks would relieve the Plant engineer of the clerical details necessary to a controlled preventive maintenance program.

In some cases, installing and operating a preventive maintenance program would require additional help or additional overtime in the initial period; but, within three to six months, the effects of the program should reduce the work load to a point where less personnel or less hours will be required than before the program was initiated.

Inspection Schedules

The determination of preventive maintenance inspection schedules is a subject of debate because correct frequencies depend on many factors such as age of equipment, condition, hours of operation per day and the importance of the equipment to the production line.

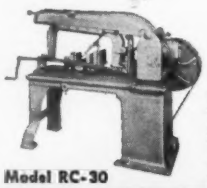
We have a prepared list of production, mechanical and electrical equipment items listing the inspection frequencies that were established during conferences among production, engineering, and maintenance personnel. These frequencies represent, therefore, a consensus of opinion.

The operating conditions and production requirements differ in each of our plants; therefore, it may be necessary to inspect some equipment more frequently, and others less frequently. This can be judged best after observing results from

CUTTING ECONOMY... with SAJO Hydraulic Hacksaws

NO PRIORITY
PROMPT DELIVERIES
ATTRACTIVE PRICES

Another Swedish contribution to lower manufacturing costs! SAJO Power Hacksaws, produced by Sweden's largest Hacksaw manufacturer, are available in three models — all Hydraulic — designed to meet the needs of the small, medium or large metal-working plants. Operation is simple and foolproof. Modern design, sturdy construction and painstaking workmanship put SAJO on a par with the finest in hacksaws. Their modest cost represents an outstanding value in this type of metal cutting equipment.



Model RC-30

Write for literature and prices on:
Light Duty Model RC-30, 6" x 6" capacity
Medium Duty Model RC-45, 9" x 9" capacity
Heavy Duty Model RC-250, 10" x 10" capacity

Each machine carrying the Austin seal is sold with the manufacturer's full guarantee and our positive assurance of user's satisfaction. Replacement parts — in stock.

Compare carefully. You'll choose SAJO!

AUSTIN INDUSTRIAL CORP. 76-X MAMARONECK AVE. WHITE PLAINS, N. Y.

DEALERS IN PRINCIPAL CITIES

the preventive maintenance inspection reports and deciding whether the established frequencies are satisfactory for existing conditions.

Not all of the equipment items we have listed are essential to keep our plants in operation, but periodic inspection of all equipment that requires maintenance, lubrication or contributes in maintaining maximum production is necessary.

The measure of the effectiveness of an inspection schedule does not lie solely in reduced maintenance costs. It may be measured also in the fewer number of delays and the increase in equipment life.

Manual of Instructions

In the past, a good mechanic could attend to maintenance without specific instructions. Today, he should have assistance to help him perform his work since equipment has become more complex and its maintenance more exacting, particularly preventive maintenance.

To standardize preventive maintenance practices and procedures, schedules of inspections, check points for equipment, etc., a Preventive Maintenance Manual is a must.

Practically all manufacturers issue instructions on how their equipment should be operated and maintained. Practices and procedures that have proved their worth are usually known to the Plant Engineer. Yet it has always been a problem to find a satisfactory way to distribute this information to the shop.

It is recommended that Standard Maintenance Procedure and Instruction Manuals which contain, not only maintenance instructions, but also plant engineering department routine, and operating and installation instructions besides the Preventive Maintenance Manual be set up. This would also be an excellent means to accumulate and issue to service personnel, new ideas and techniques that will help maintenance; for example, ideas that are published in periodicals. This means that when the engineer comes across ideas or techniques in an article, he has the means to pass them along to all of his personnel.

Standards and passing of information to service personnel are of great value but should not be overdone to the point where mechanics disregard them as just so much more paper.

Lubrication Scheduling & Instruction

A study of the causes of mechanical breakdowns will show that a very large number can be attributed directly to lack of proper lubrication. The losses from failure to lubricate all necessary points requiring lubrication, and the breakdowns resulting from the use of the wrong lubricant, are enormous.

In order to overcome these

. . . *Continued on page 146*

DEBURRING PRODUCTION *increased* 85%

AT BAKER-RAULANG

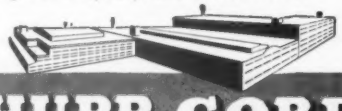
Leading Manufacturer Of Electric Lift Trucks

with

GLOBE TILTING TUMBLING BARRELS

Insulating bushings were formerly deburred with emery wheels at a rate of 300 per hour. With use of a Globe Tilting Tumbling Barrel, production was stepped up to 2000 pieces per hour. In addition to an 85% production increase, the tumbling barrel released two men for work in other departments.

Extra economies are obtained by tumbling odd shaped pieces difficult to deburr with hand wheels. With the Globe Tumbling Barrel, Baker-Raulang has doubled deburring production, and is obtaining finer finishes, using only 3 men in place of 5 men formerly required.



FREE EXPERIMENTAL SERVICE

Let Globe's experimental engineering service analyze your finishing problems. Send samples of parts and completed piece to show finish desired and Globe will provide detailed finishing recommendations. Write today! No obligation, of course.

HUPP CORPORATION

GLOBE STAMPING DIVISION

1250 WEST 76th STREET • CLEVELAND 2, OHIO

SERVING INDUSTRY SINCE 1902

PRESCRIPTIONS FOR PRODUCTION

Ever faced with the problem of mounting an electrical control housing to heavy boiler plate . . . quickly and accurately? An impact gun-type stud driver may be the answer. Load the gun, aim it with the housing held in position, pull the trigger, and the housing is securely anchored. No painstaking transfer of mounting points, no timetaking drilling or hand punching of holes.

Uniform deposition of sprayed finishes can now be made on inside corners and concave surfaces where "blow-back" was always troublesome. Leading manufacturer of paint heaters is introducing a new method of achieving "airless atomization" of industrial finishes, completely eliminates blow-back or splash.

One builder of automatic lathes adds automaticity features to high velocity turning — equips machines with automatic air-operated tailstock rams for pressing the blank onto a splined arbor. At the end of the cutting cycle, ejector pins in the arbor automatically push the machined piece forward out the loading section of the arbor from which it is removed manually.

Precision bore-to-bore sizing, automatically, on new production honing machine that eliminates effects of cut-and-try, uneven stone wear, and variations in bore prefinish. Bores from 2" to 5½", up to 22" length, can be accommodated.

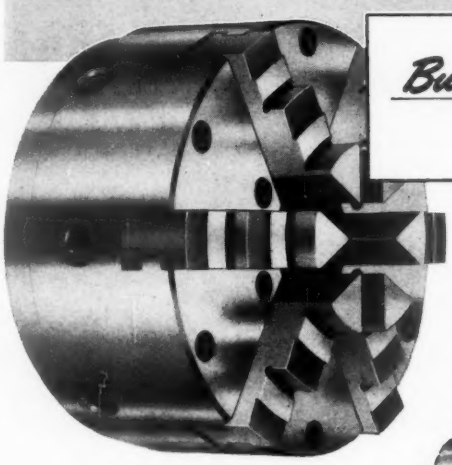
Forming of pre-finished metal sheets may be a major manufacturing advantage in the application of Nubelon S, a new silicone resin base finish that has many of the surface hardness and durability qualities of porcelain enamel without porcelain's brittleness. The new coating fills the gap between organic appliance enamels and porcelain enamel, will likely replace both on a wide medium range of applications.

A new light-duty trolley conveyor (fully enclosed chain) has appeared on the market. Composed of fully standardized straight and curved sections, a conveyor line for spray painting, assembly, or packaging can be set up very quickly and economically.

And now you can get counterbores with interchangeable pilots; fluoboric acid, in safety p'astic carboys, for effective stripping of plating racks, for electropolishing for mirror finishes, for removal of light oxide films and for many other difficult jobs; a fast-acting portable pistol-grip spot welder, with built-in thyroton controlled timer switch, capable of welding many materials to a 3/16" combined thickness; a stair-climbing hand truck that has two rocker shoes just left of the wheels to keep the load supported until wheels reach the next level, climbs easily up or down stairs; or, a self-opening die head that cuts machine screw threads or pipe threads, is used as a rotating tool or as a stationary tool.

Submerged and inert arc welding is efficiently done on a new design stake welding machine, featuring flat clamping under high pressure with no tendency for seam separation under load. There is less operator interference and better visibility in the welding area.

FASTER PRECISION CHUCKING AT MUCH LESS COST!



Buck AJUST-TRU CHUCKS

Lines up dead true in less than a minute. Rechucks to .0005 precision at scroll chuck speeds. Ends most needs for collets, step-collets, mandrels, stub arbors. Does the work of over $1,000 in special equipment, at no premium in price. It's the most revolutionary development in 50 years. Send for full details.

Buck 6-JAW CHUCK
WITH 6 EXTERNAL, 6 INTERNAL JAWS
4", 5", 6", 7½" DIAMETERS

Buck 3-JAW CHUCK
In 4", 5", 6" and 7½" diameters. 3 external, 3 internal jaws. Complete line of adapters for all Ajust-Tru chucks.

BUCK TOOL COMPANY
418 SCHIPPERS LANE • KALAMAZOO, MICH.

NEW SUPER-GRIP 4-JAW
INDEPENDENT CHUCK FOR 9" to 16" LATHES
Most chucks for 9" to 16" lathes are either too light and cheaply made to hold work securely, or too heavy for the lathe and clumsy to handle. Here's the happy medium — a chuck with ideal weight, providing much more "holding power" from its ⅛" larger diameter, finely threaded screws. Also eliminates ⅝" overhang . . . improves accuracy . . . permits heavier cuts. 6", 8" and 10" models. Send for latest catalog.

PRESCRIPTIONS FOR PRODUCTION

Checking of gear teeth on massive gears has been a problem to many builders of major apparatus. Now comes a machine that checks both lead and axial pitch on large helical or herringbone gears, as well as parallelism of teeth on large spur gears. Will check pitch on gears 18″ to 48″ OD, face width 25″ max., and shaft length 96″ max. Uses sine bar principle to check right or left hand leads from 0 to 80″. Either manual or power drive may be used.

Have you ever thought of using cellular rubber sheeting between two surfaces to compensate for surface variation and to reduce machining, finishing, and fitting costs? Spongex comes in sheets and rolls.

Increased wheel life and tool life can be obtained with the Misticator, a compact air-pressurized misting unit that can be used with any coolant. Misting contributes to fast evaporation from contact surfaces, adding to the cooling action. This is further aided by the cooling effect of the air blast, which also keeps wheel from loading. Unit is quickly mounted or detached on any grinder, is also applicable to many machining operations.

Speed up assembly and other operations on small instruments—welding, brazing, metallizing, etc.—with small, light, electrically turned, variable speed positioner. The 15½″ turntable carries 300-lb load, moves continuously or intermittently, can be inched, from 1/4 rp/m up.

The extreme pressures and high temperatures of hot-forging operations impose severe lubrication problems. On one type die showing a normal average life of 11,900 impressions, pre-treatment with Aquadag (a concentrated dispersion of colloidal graphite in water) resulted in die life being increased to 22,500 impressions.

New single face lapping machine utilizes bonded-abrasive laps, up to 60″; provides clean, bright surfaces; reduces human factor in attaining uniform, high accuracy on large areas.

A 48″ rotary table and angular positioner for rotary drills and boring mills features a self-contained motor which rotates the face plate (table) to any degree, facilitating setup. A handwheel is then used to adjust table to within 2 min., by vernier scale. Table can be adjusted to any degree from vertical to horizontal in one direction and to 30° below horizontal the opposite way.

Precision centerless grinding of straight or contour work, 1/16″ to 1″ diameter, can be performed on a compact machine with floor space requirement of only 23″ x 36″, excluding the coolant tank. A gearless drive eliminates tooth pattern. Tolerances as fine as 0.0003″ can be consistently held.

High-speed evacuation and automatic sealing of electronic tubes, hermetically sealed assemblies, light bulbs, vacuum bottles . . . on new high vacuum 16-head rotary machine. Standard design is easily modified for many applications. Can be adapted for back filling with gases. Normally, turret turns continuously with entirely automatic operation, 25-30% production rate increase.

CALL Sid Tool COMPANY "HARD TO FIND TOOLS FOR STOCK DELIVERY"

Why Wait for SPECIAL TAPS?

we have them in STOCK for IMMEDIATE DELIVERY

HIGH SPEED **SPECIAL** RIGHT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
4	32-40-48-64	3/8	12-16-18-20-27-28-32-36-40-48	1-3/4	8-10-12-14-16-18-20-24
5	30-32-36-40-80	7/16	12-16-18-22-24-27-28-30-32-36-40	1-13/16	8-10-12-14-16-18-20
6	30-40-48-56-80	1/2	12-14-16-18-22-24-26-27-28-30-32-40	1-7/8	8-10-12-14-16-18-20-24
7	32-40	9/16	16-20-24-27-28-30-32-40-48	1-15/16	8-10-12-14-16-18-20-24-28
8	24-30-36-32-40-44-48	5/8	12-14-16-20-24-27-28-32-36-40	2	4-1/2-8-10-12-16-18-20
9	24-28-32-40	11/16	11-16-18-20-24-27-28-30-32	2-1/16	12-14
10	28-30-36-40-48-64	3/4	8-11-12-14-16-20-24-26-27-28-32	2-1/8	12-16-20
12	20-22-32-36	13/16	16-14-16-20-32	2-3/16	12-16
14	20-24-28	7/8	10-12-16-18-20-24-27-28-32	2-1/4	4-1/2-8-12-14-16-18
1/16	60-64	15/16	8-9-10-12-14-16-18-20-24-32	2-5/16	12-16
5/64	72	1	10-12-16-18-20-24-27-32-40	2-3/8	12-16-18
3/32	48	1-1/16	12-14-16-18-20-24	2-1/2	8-10-12
7/64	48-56	1-1/8	8-10-14-16-18-20-24-32	2-9/16	16
1/8	32-40	1-3/16	8-10-12-14-16-18-20-24	2-5/8	12-16-20
5/32	32-36-40	1-1/4	8-10-14-16-18-20-24-32	2-3/4	16
9/64	36-40	1-5/16	12-14-16-18-20-24-32	2-7/8	8-12-16
11/64	36	1-3/8	8-10-14-16-18-20-24	3	8-16
3/16	20-24-32	1-7/15	8-10-12-16-18-20-24	3-1/4	8-12-16
13/64	32	1-1/2	8-10-14-16-18-20-24-28	3-1/2	8-12-16
7/32	24-28-32	1-9/16	18-20-24	3/7-8	8
1/4	18-24-26-27-30-32-36-40	1-5/8	5-1/2-8-10-12-13-16-18-20-24	4	8-12
5/16	16-20-22-27-28-32-40	1-11/16	10-12-14-16-18-20-24		

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
0	80	3/8	16-24-32	1-3/8	8-9-10-12-16-18-20-24
1	56-64-72	7/16	14-20-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	8-9-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-16-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	16	1-13/16	8-10-12-14-16-18-20
10	24-30-32-40	7/8	9-12-14-18-20	1-7/8	8-10-12-14-16-18-20
12	24-30-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
1/4	20-28-32	1-1/8	7-12	2	4-1/2-10-12
5/16	18-20-24-28-32	1-1/4	7-12-16-18		

• **SPECIAL AND LEFT HAND DIES IN STOCK**

Prices on Application. We are always adding new sizes

NOTE: Oversize - Undersize - Metric - 64th and 32nd Size Taps Available for Quick Delivery

Dealer Inquiries Invited

• Are you on our monthly mailing list? Write us today!

SID TOOL COMPANY, INC.

CUTTING TOOL SPECIALISTS

126 LAFAYETTE STREET • NEW YORK 13, N. Y. PHONE: RE 2-4270

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Grinding Stresses, from page 85

an important part of the residual stress is due to anisotropic plastic deformation of the surface metal by the abrasive grits or the cutting tool.

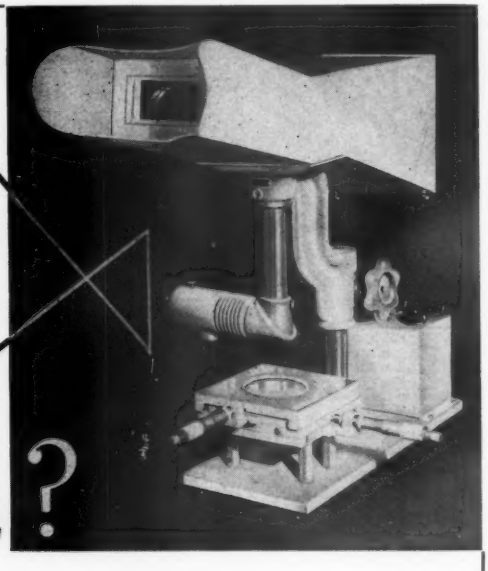
Figure 6 and 8 also point out the fallacy in the common expression "the tensile stress caused by grinding". In all but one case, both principal stress components change sign at least twice, as depth below the surface increases. It is quite possible that the magnitude of the stress fluctuation close to the surface is dependent upon the carbon and alloy contents of the steel and that the effect is either non-existent in low carbon steel or is too small to be readily detected.

The sixth specimen, ground simultaneously with the five for which data are presented in Figures 7 and 8, was examined for evidence of the phase transformations to which other investigators have attributed the minima in their stress curves. X-ray diffraction patterns of the ground surface showed no trace of austenite or martensite. Subsequent taper sectioning and metallographic examination completely substantiated the x-ray findings. Apparently, either the temperature of the surface did not rise above the critical during grinding or it did not remain there long enough to allow the fine spheroidized (sorbitic) structure to transform to austenite.

In view of the consistent inequality of the two principal stresses, it is unlikely that any explanation of the origin of residual grinding stress based solely upon thermal arguments can be complete. Plastic deformation arising either from differential thermal expansion caused by temperature gradients near the area of contact of the wheel and the work or from allotropic transformations induced by the heating and cooling of the surface metal, would most certainly result in a residual stress which is isotropic in the plane of the surface. Since this is obviously not the case, both thermal and applied mechanical stress must be involved.

Although the exact point at which the residual stress resulting from grinding joins the initial stress resulting from the heat treatment of the specimens is difficult to ascertain because of the gradual blending of the two, it is obvious in Figure 6 and 8 that the depth of grinding stress penetration increases with increasing wheel depth of cut. An increase in the net positive area under the stress curves determines the trend of the curves in Figure 4.

The stress at the surface depends upon the depth of cut. That stress parallel to the abrasive trajectory rises rapidly and appears to approach a limiting



HOW BIG IS BIG?

As Big As The Engineering Skill offered by Stocker & Yale.
This Optical Comparator, Small in Size is Serving America's Greatest Industries. 250 Stocker & Yale Projectors check the Quality of General Electric Instruments at their "World Headquarters for Electrical Measurements", West Lynn, Mass.
What is your Inspection Problem?

Write for Projection Brochure—Contains 10 Applications Stories

Stocker & Yale INCORPORATED | MARBLEHEAD MASSACHUSETTS

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

value with increasing depth of cut. That stress perpendicular to the abrasive trajectory does not seem to be particularly sensitive to depth of cut in the range tested. Apparently, both of the principal stresses may have negative values which are appreciable for depths of cut of 0.0002″ or less, other conditions being the same.

In an auxiliary experiment, tensile tests were run on three standard 0.505″ dia. cylindrical specimens having a 2″ gauge length. Results indicate that the limiting value approached by stress parallel to the abrasive trajectory is the bulk tensile strength of the steel.

Results of Lapping Tests

Curvature measurements on the three test pieces at periodic intervals during the lapping test and during subsequent sectioning of the lapped surfaces by etching were plotted as averages of the curvatures along two orthogonal directions. Corresponding values for the two directions agreed within the estimated error of measurement, indicating that the test pieces were bent spherically, As lapping progressed, the curvature decreased to a limiting negative value which was independent of both the length of the test and the total amount of metal removed, ignoring small effects of the initial thermal stresses. Although the higher (0.65 psi) lapping pressure removed metal at a more rapid rate, the magnitude of the final equilibrium curvature resulting from it was less than for the lower (0-07 psi) pressure.

Lapping stress distributions were calculated by equation, using values from curvature measurements obtained after etching. Stress distributions also show abrupt change in slope.

It is apparent that the stress induced by the particular lapping procedure tested is one of uniform compression in the plane of the surface. It is nearly constant throughout a layer extending about 0.0002″ below the surface and then decreases sharply to a negligible value. Although the stress is quite high, the bending caused by it is small because of the shallowness of the layer in which the stress acts. The lack of directionality of the stress is a consequence of the directional symmetry of the abrasive trajectories across the surface, but the freedom of the abrasive to roll and the lightness of the cut may also be contributing factors. It is not clear whether the predominance of compression is due primarily to the gouging action of the loose abrasive or whether the shallowness of the cut is an important factor, as in the case of grinding with bonded abrasives. Some evidence for the

. . . *Continued on page 127*

Difficult jobs that demand extreme precision now possible with unskilled operators!

NO. 40M HEAVY DUTY
Vertical "Aeroframe" Profiler and Milling Machine

PARTIAL SPECIFICATIONS

Table working surface.....36" x 48"
Table travel.....48"
(Available with table travel up to 10 ft.)
Spindle speeds (12).....125-4600 RPM
Motor, maximum.....15 HP
Standard Machines hand feed. Power feeds any or all the movements.

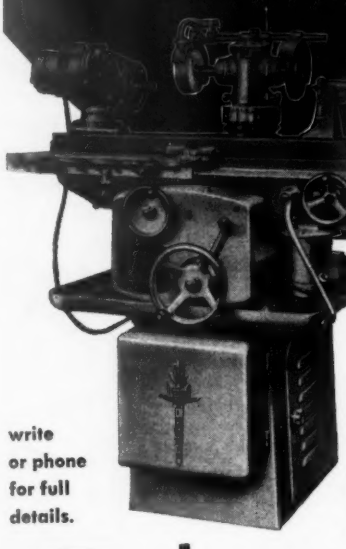
MOREY designed and built, the 40M "Aeroframe" Milling Machine has great rigidity and power to take full advantage of tungsten carbide tools. It is ideal for milling and profiling aluminum and magnesium air frames of computing, type settings and similar complicated precision machine parts. Minimum vibration at the cutter spindle. Copying attachment available for any and all movements.

Write today for complete details.

MOREY ....for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

#2 IMPERIA universal tool and cutter grinder



immediate delivery

Swing over table 10"
Distance between centers 20"
Surface of table 5" x 32"
4 spindle speeds, r.p.m. 2900 to 5800

Thousands in use all over the world. Many in this country where they may be seen in operation.

write or phone for full details.

Parker Machine Company, Inc.
158 Pioneer St., Brooklyn 31, N. Y.
TRiangle 5-2103 and 2157

N.T.D.M.A. Apprentice Training Survey

A survey of apprentice training in the contract tool and die industry will be made by the national Tool & Die Manufacturer's Association. Purpose of the survey is to determine what is now being done; to obtain information and suggestions that will make apprenticeship more effective; and to stimulate interest in expanding apprenticeship training which must be relied upon to develop the highly skilled craftsmen the tool and die industry needs.

These are some of the questions that will be put to more than 700 member shops of the NTDMA:

Are you now training apprentices?

How many men are being trained as apprentices?

Are you training specialists in machine tool operation?

How do you select apprentices?

Do you require aptitude tests? By whom given?

Do you draw apprentices from trade and technical schools?

A film on apprentice training will be released later this year by the association.

ATLANTIC GEARS

SPUR - SPIRAL - WORM - BEVEL GEARS
GENERATED WITH PRECISION ON MODERN EQUIPMENT
Send Samples or Blueprints for Quotation
Call CA 6-1440
ATLANTIC GEAR WORKS, INC.
200-T LAFAYETTE ST. • NEW YORK 12, N. Y.

– CONTRACT TOOLING AND PRODUCTION –

Illinois

DRESEL-BETZ CO.
Belleville, Ill.

Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL and ENGINEERING CO.

19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

ROMULUS TOOL & ENGINEERING COMPANY

36051 Goddard Rd., Romulus, Michigan. Jigs, Fixtures, Special Machines, Production Machining and Hydraulic Assemblies. Phone 238.

New York

AMERICAN MEASURING INSTRUMENTS CORP.

The AMIC Bldg., 21-25 44th Ave., Long Island City 1, N. Y. Jigs, fixtures, gages, dies, precision parts.

CONRAD & MOSER

2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines Aluminum Cast Parts, Aluminum Sheet Formed Housings.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio.
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

H & P DIE STAMPING CO.
13947 Triskett Rd. Cleveland 11, Ohio
PRECISION DIES, JIGS & FIXTURES
Quality Stampings
Bus & Trailer Parts

THE INDUSTRIAL MACHINE CO.

1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.

5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.

998 Broadway, Bedford, Ohio, Bedford 2-1234. Tool Makers—Short Run Production Work.

A. P. SCHRANER & CO.

3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

TOOLCO COMPANY

Box 172A3, GLENDALE - MILFORD ROAD, SHARONVILLE, OHIO. Ph.: Sycamore 6343. Small Tools, Dies, Jigs, Fixtures and Special Equipment. Parts Production Runs. Catering to Radio Electronics and Instrument fields of Industry.

* TRY BIG JOE IN YOUR PLANT

See for yourself how a Big Joe Hydraulic Lift...

- Solves your most troublesome materials handling problems.
- Raises or lowers heavy loads smoothly to loading heights.
- Moves easily in cramped areas.
- Saves time, cost and mishaps.

MANUAL MODELS

Capacity 750 lbs. Lifting Heights to 58" Prices from **$236.50**

BATTERY OPERATED MODELS

Capacity 1000 lbs. Lifting Heights to 80". Prices from **$587.50**

See us at Packaging Show, Booth 812, Chicago, April 20-23; also at The National Materials Handling Exposition, Booth 1434, Philadelphia, May 18-23.

Write for Specifications on All Models.

Distributors in Principal Cities

BIG JOE MANUFACTURING COMPANY

904-6 W. Jackson Blvd. • Chicago 7, Illinois

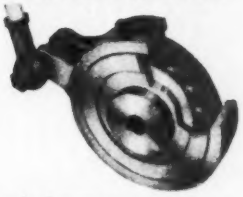
Cable Address: Big Joe

*T-M. REG. IN U. S. PAT. OFF.

DURANT

INVESTIGATE THE DURANT LINE OF PRESS ROOM EQUIPMENT

INCREASE PRODUCTION! REDUCE COSTS!



THE SELECT-O-MATIC ROLL FEED INDEXER

Replace your present roll feed clutch with this DURANT SELECT-O-MATIC multi pawl indexer that accurately controls close feeding due to its 6720 possible stations.

Write for complete information on our line of economically priced press room equipment

ROLL FEEDS

Choose from seven different models that take stock from 2" to 5" wide — Insures accurate feeding — Reversible — Simple to install.

SCRAP CHOPPERS

Fits all power presses and has simple electrical plug in installation. Low first cost pays for itself —Pennies per day to operate.

STOCK OILERS

Prolong die life as they clean and lubricate stock in one operation. Variety of models are available. Eliminates hand oiling yet inexpensive.

STOCK STRAIGHTENERS

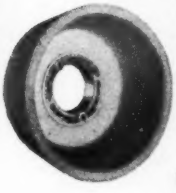
Motor driven equipment (shown) is perfect for thin materials. Top rolls are adjustable for thickness. Standard straighteners also available.

Inquire about our STOCK REELS, FOOT PRESSES, COIL CRADLES, WIRE STRAIGHTENERS, and PRESS FEEDS. Complete free catalog ready now. Write today.

DURANT TOOL SUPPLY CO. 55 ORANGE STREET, PROVIDENCE 3, R. I.

HOB GRINDING

SURFACING



CUTTER GRINDING

FREE

Tool room grinding... Looking for ways to boost output and lower costs? Then get your *free* copy of "Maintenance of Alloy and High Speed Cutting Tools." Tells you "how to," helps you choose the *right* wheel for each job—from the complete line by CARBORUNDUM.

CALL YOUR CARBORUNDUM DISTRIBUTOR TODAY

He's your best bet for counsel on any grinding problem... for complete stocks ...prompt delivery.

THE CARBORUNDUM CO., Dept. TP 81-35A
Niagara Falls, New York

YES! I'd like a copy of Booklet 10 on cutting tool maintenance.

NAME AND TITLE

COMPANY STREET AND NUMBER

CITY ZONE STATE

CARBORUNDUM

TRADE MARK

...the ONLY source for EVERY abrasive product you need

"Carborundum" is a registered trademark of The Carborundum Company, Niagara Falls, N. Y.

81-35A

short run stampings

DESCRIBED IN NEW CATALOG No. 718

New catalog describes HPL's "know-how" which can save up to 80% of conventional tooling costs.

Facilities for producing stampings in runs of 25 to 25,000 pieces in various shapes and materials are described and shown. **HPL** is making this attractive four-page catalog available to production, purchasing and management personnel to assist them with their stamping problems. Catalog No. 718 will be sent to you upon receipt of publication or letterhead request.

1120-HPL

HPL Manufacturing Co.

15269 MILES AVENUE • CLEVELAND 28, OHIO

Grobet RIFFELRS

GROBET produces more RIFFLERS in more shapes and sizes than any company in the world.

Sold Through Leading Supply Houses.

Send for Catalog AF-3

GROBET FILE CO. of AMERICA, Inc.
421 Canal Street
New York 13, N. Y

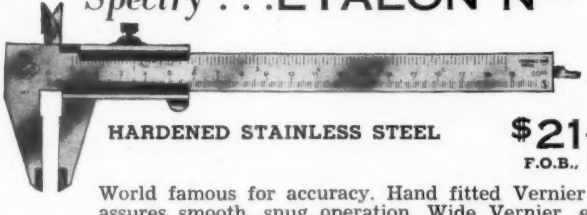
HARDENED and GROUND HSS BLANKS

Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write or Phone ORange 3-4301 for price list D-3

WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.

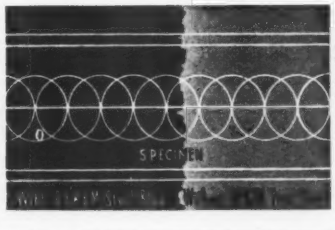
Specify . . .ETALON No. 17



HARDENED STAINLESS STEEL **$21.95** F.O.B., N. Y.

World famous for accuracy. Hand fitted Vernier slide assures smooth, snug operation. Wide Vernier, exceptionally easy to read. English or English and Metric graduations. Handsome, form-fitting wooden case.

• *Ask YOUR DEALER or write*
ALINA CORPORATION 401 Broadway, New York 13, N.Y.



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2303L NORTH 11TH ST. ST. LOUIS, MO.

. . . Grinding Stresses, from page 123

latter effect is seen where the stress resulting from the higher lapping pressure, and presumably larger grain depth of cut, is less comprehensive than those resulting from the lower pressure between the specimen and the lap. Another effect of lapping pressure is the slightly greater depth of stress penetration in the specimen lapped at the higher pressure.

Conclusions

1. The stress resulting from surface grinding is biaxial. The principal stresses lie parallel to the surface and are oriented parallel and perpendicular to the abrasive trajectories. This behavior is not peculiar to grinding but seems to be true of all surfacing methods employing unidirectional cutting with fixed points or edges.

2. Residual grinding stress is due to plastic deformation of the surface metal. Although temperature is a factor in determining resistance to deformation, grinding stress is not due solely to deformation caused by thermal stress but to deformation caused by mechanical stress as well.

3. The residual stress resulting from surface grinding manganese oil-hardening tool steel fluctuates rapidly as a function of depth at distances very close to the surface. This may or may not be a general behavior of all steels under similar test conditions.

4. Under the conditions employed in the grinding tests, the principal stress parallel to the trajectory in a layer extending about 0.0001" below the surface increases with the depth of cut toward a limiting value which agrees closely with the bulk tensile strength of the steel. The corresponding principal stress perpendicular to the trajectory is compressive throughout the range tested and does not vary appreciably with depth of cut. There is some indication that both stresses assume compressive values at wheel depths of cut of 0.0002" or less.

5. The thickness of the layer plastically deformed by surface grinding manganese oil-hardening tool steel increases with depth of cut and is five or six times the latter in the range tested.

6. The residual stress induced with loose abrasive under conditions employed in the lapping test is one of equal biaxial compression. The stress has a high compressive value throughout the plastically deformed layer which is 0.0002" or 0.0003" thick, and drops sharply to a negligible value at its lower boundary.

7. The so-called nominal stress is not a very reliable indication of the true stress resulting from either grinding or lapping.

Announcing THE NEW WELLS Model 800 Horizontal Metal Cutting BAND SAW

Approved for use with the revolutionary NEW MILFORD REZISTOR HIGH SPEED STEEL BAND SAW BLADE

Designed for production cut-off work, particularly for cutting stainless steel

THE NEW WELLS MODEL 800 is the first metal cutting band saw designed to capitalize on the remarkable advantages, and to be approved for use with the new MILFORD REZISTOR High Speed Steel Band Saw Blade.

Model 800, engineered for heavy duty work, provides for practical and efficient use of blades of 1" in width, especially the new High Speed Steel Band Saw Blade. This blade, used with Wells Model 800, has established new records . . . higher level of cutting efficiency . . . more cuts per blade.

Wells Manufacturing Corporation has been authorized by the producers of this new blade to supply complete information, and would be glad to study your metal cutting jobs to determine which blade, when used with Model 800, will show you cost savings in your cut-off operations.

DESIGN FEATURES

- Exclusive new Wells "constant-load" blade tensioning device.
- Extra rigid, heavily built counter-balanced frame and beam.
- New style band wheels.
- Synchronized speed blade cleaning brush.
- Improved, special heavy duty blade guides.
- New expanded range of cutting speeds.
- Capacity: 8" diameter.

Wellsaws

Wells

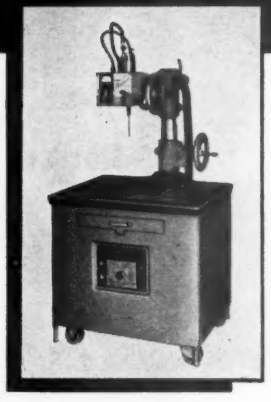
The Pioneers of Horizontal METAL CUTTING BAND SAWS

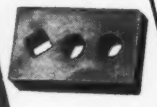
WELLS MANUFACTURING CORPORATION
1940 CEDAR STREET, THREE RIVERS, MICH.

METAL DISINTEGRATION

and what it can do for you

Remove broken taps fast without distortion





Cut any shape hole in cemented carbides

Cut dovetails in hardened dies

Cut oil holes in hardened gears without annealing

Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.)

There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

Metalmaster

DIVISION OF CLINTON MACHINE COMPANY

CLINTON, MICHIGAN

Automatic Factories and Mechanization

Progress toward automatic factories and mechanization were recently singled out as the "logical way to support the nation's increased production goals" in a talk at the annual meeting of the Cutting Tool Manufacturer's Association by Arthur F. Vinson, assistant manager of manufacturing for the General Electric Company.

Vinson cautioned the more than 200 members that "complete mechanization, although a necessity for economy, is a long way off" and recommended a "gradual progressing" into complete mechanization rather than "jumping headlong into it".

He pointed out that the electrical industry alone expects to build as much equipment in the next ten years as it has in its entire 75 year history.

"To achieve this rate of production would require twice the number of people now employed in the industry," he said. However, Vinson added, economists expect the labor force to increase only 11 per cent in the coming decade.

He stated that the electrical industry's production plans would require "a fantastic amount of additional buildings at present production rates."

The answer to increased production without greatly expanding the labor force or the factory space, according to Vinson, is to increase, through mechanization, the production capabilities of existing manpower and manufacturing facilities.

Vinson said that World War II contributed greatly toward the development of automatic processes through the strides made in the field of computing mechanisms and control systems.

However, he stated these steps were a part of the "logical order of development" which has been going on for years in the direction of more complete mechanization.

Vinson asserted that those who progressively mechanize within the limits of their ability to support technical improvements will contribute the most towards the support of the expanding American economy.

THREAD MEASURING MADE EASY WITH NEW 60° THREAD TRIANGLES

Quickly checks all 60° standard and special threads from 4 to 56 pitch—Any O.D. No "fancy" calculations — just add a constant to O.D. That's all there is to it. Comes complete with plastic chart.

— OTHER TOOLS —

★ Hand Spring Winders
★ Milling Machine Clamps
★ Die-Handling Tables
★ RPM Checkers
★ Radius & Angle Dressers
★ Drill Press Vises
★ Height Gauges
★ Rotary Tables

Check Inform-A-Gram Card No. 123A for Tool Catalog

MONTGOMERY TOOLROOM SPECIALTIES

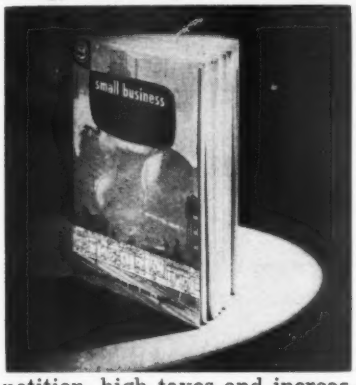
53-T-PARK PLACE • Phone: BE 3-1229 • N.Y.C. 7, N.Y.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Small Business Summary

"Small business, its role and its problems," is the title of this booklet which has recently been made available by the Economic Research Department, Chamber of Commerce of the United States, Washington 6, D. C.

There has never been any doubt about the importance of small business to our economy. There has been concern about its ability to survive, to grow, and to prosper. Modern technology and the pressure of com-



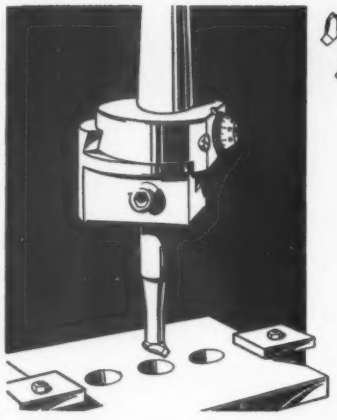
petition, high taxes and increasing government regulation raise new problems for all business, including the small one.

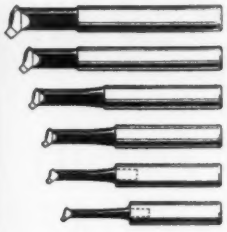
This booklet does an excellent job of answering such questions as — does small business complement or conflict with big business; and does the small business have a particularly hard time raising capital. Our verdict—Interesting and Useful. The price—single copies 50c, 2 to 10 copies 40c over 10 copies 30c each.

"Desegatized"

Booklet "Your Tooling and Desegatized Steels" has just been made available by the Latrobe Steel Company, Latrobe, Pennsylvania. It's a ten page, pocket size production that won't take up more than ten minutes of your reading time, and it contains a great deal of information on the company's "Desegatized" process in an unusual graphic form. The process, of course, permits the absolute control of carbide segregation, giving a free-machining product without hot working problems. If you specify, use, or purchase steel you shouldn't miss your copy. **Circle D1.**

CARBIDE BORING TOOLS





THREE DISTINCTIVE STYLES

- for boring
- for facing & bottoming
- for internal threading

All With Solid Carbide Heads

Most standard sizes in four popular carbide grades are

IN STOCK FOR IMMEDIATE DELIVERY

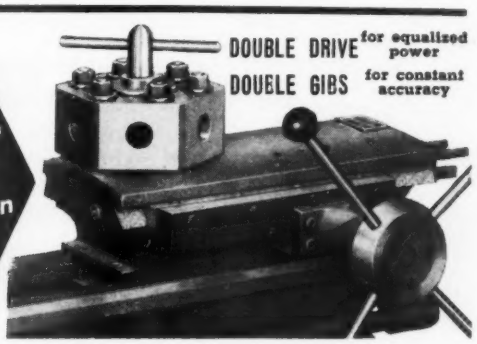
Write for free literature to

R.B.TOOL CO., Inc.

786 No. Broadway White Plains, N. Y.

Enco Self-Indexing HEXTURRET

For Lower Production Costs and Speedier Output



DOUBLE DRIVE for equalized power

DOUBLE GIBS for constant accuracy

√ Custom built to fit all lathes from 9″ to 18″.

√ Smooth, sensitive control with Pilot wheel drive through twin gears and racks.

√ All bearing surfaces hand scraped.

√ All parts of indexing mechanism hardened, assuring accuracy.

Close tolerance shoulder-screw job held to plus .002; minus .000.

Manufacturers of the most complete line of HEXTURRET BED TURRETS, TURRET TOOL POSTS, and TAILSTOCK TURRETS in the country.

ENCO *Manufacturing Co., Dept.* **743**

4524 W. FULLERTON AVE., CHICAGO 39, ILL.

SEND FOR CATALOG No. 53

Reasonable Deliveries

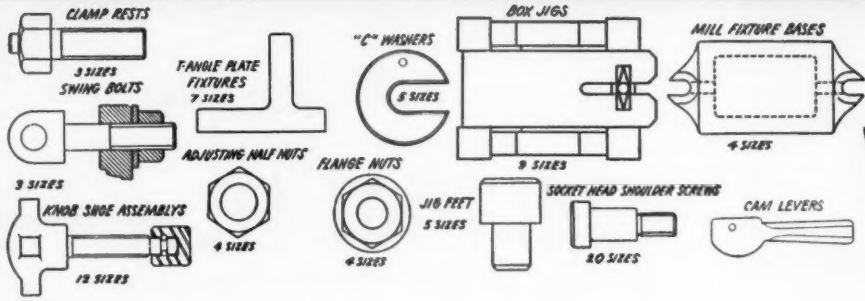
NOBLE & STANTON *Standards*

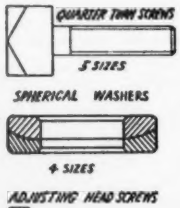
The Quality Line JIG and FIXTURE PARTS

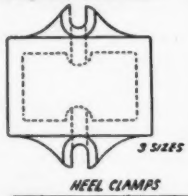
SAVE MAN-HOURS

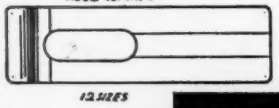
- Cut Designers Time
- Cut Toolroom Costs

OVER 300 COMPONENTS AVAILABLE AT ONE-THIRD THE COST OF CUSTOM-MAKING









NEW 1953 Standards NOW AVAILABLE

The rush is on . . . manpower shortages are here! Don't waste the valuable time of your designers and toolmakers in custom-building jig and fixture components.

Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

WRITE FOR CATALOG. Send today for this free 52-page book of drawings, specifications and prices.

Ask for your copy of OUR NEW CATALOG

Manufacturers of GENUINE NOBLE & STANTON Parts

STANDARD PARTS CO.

1002 BROADWAY • BEDFORD, OHIO

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Inform-A-Gram Card Section

To obtain additional information on ADVERTISED PRODUCTS, note number listed opposite advertiser's name in index, page 172, and circle corresponding number on INFORM-A-GRAM advertisements card.

To obtain additional information on EDITORIALLY DESCRIBED PRODUCTS and/or LITERATURE note number listed at end of each editorial item and circle corresponding number on INFORM-A-GRAM editorial items card.

Drop card in mail — No postage required.

If you want to receive *TOOLING and PRODUCTION* regularly, or want to notify us of your address change, use special request card at bottom of this page.

INFORM-A-GRAM ADVERTISEMENTS IN APR., 1953 Issue

DO NOT USE THIS CARD AFTER JUNE 30, 1953

Please print

Name _____ Title _____

Company _____ Address _____

City _____ Zone _____ State _____

1	18	33	64	83	99	114	126A	136A	140B	145A	149D	155A	162B	167C	169E
2	19	34	65	84	100	115	126B	136B	140C	145B	150A	155B	162C	167D	171A
3	20	35	67	85	101	116	126C	136C	141A	146A	150B	155C	163	168A	171B
4	21	36	69	86	102	117	126D	136D	141B	146B	152A	155D	164A	168B	171C
5	22	37	71	87	103	118	126E	136E	142A	147A	152B	156A	164B	168C	173
6	23	38	72	89	104	119	127	136F	142B	147B	152C	156B	165A	168D	174
7	24	39	73	90	105	120	128A	137A	142C	147C	152D	159A	165B	168E	
8	25	40	74	91	106	121	128B	137B	142D	147D	153A	159B	165C	168F	
9	26	41	75	92	107	122	129A	138A	143A	148A	153B	160A	165D	168G	
10	27	42	76	93	108	123	129B	138B	143B	148B	153C	160B	166A	168H	
12	28	43	77	94	109	124A	130	138C	144A	148C	153D	161A	166B	168J	
13	29	44	78	95	110	124B	133	138D	144B	148D	154A	161B	166C	169A	
14	30	46	79	96	111	125A	134A	139A	144C	149A	154B	161C	166D	169B	
16	31	61	81	97	112	125B	134B	139B	144D	149B	154C	161D	167A	169C	
17	32	63	82	98	113	125C	134C	140A	144E	149C	154D	162A	167B	169D	

INFORM-A-GRAM ADVERTISEMENTS IN APR., 1953 Issue

DO NOT USE THIS CARD AFTER JUNE 30, 1953

Please print

Name _____ Title _____

Company _____ Address _____

City _____ Zone _____ State _____

1	18	33	64	83	99	114	126A	136A	140B	145A	149D	155A	162B	167C	169E
2	19	34	65	84	100	115	126B	136B	140C	145B	150A	155B	162C	167D	171A
3	20	35	67	85	101	116	126C	136C	141A	146A	150B	155C	163	168A	171B
4	21	36	69	86	102	117	126D	136D	141B	146B	152A	155D	164A	168B	171C
5	22	37	71	87	103	118	126E	136E	142A	147A	152B	156A	164B	168C	173
6	23	38	72	89	104	119	127	136F	142B	147B	152C	156B	165A	168D	174
7	24	39	73	90	105	120	128A	137A	142C	147C	152D	159A	165B	168E	
8	25	40	74	91	106	121	128B	137B	142D	147D	153A	159B	165C	168F	
9	26	41	75	92	107	122	129A	138A	143A	148A	153B	160A	165D	168G	
10	27	42	76	93	108	123	129B	138B	143B	148B	153C	160B	166A	168H	
12	28	43	77	94	109	124A	130	138C	144A	148C	153D	161A	166B	168J	
13	29	44	78	95	110	124B	133	138D	144B	148D	154A	161B	166C	169A	
14	30	46	79	96	111	125A	134A	139A	144C	149A	154B	161C	166D	169B	
16	31	61	81	97	112	125B	134B	139B	144D	149B	154C	161D	167A	169C	
17	32	63	82	98	113	125C	134C	140A	144E	149C	154D	162A	167B	169D	

INFORM-A-GRAM EDITORIAL ITEMS IN APR., 1953 Issue

DO NOT USE THIS CARD AFTER JUNE 30, 1953

Please print

Name _____ Title _____

Company _____ Address _____

City _____ Zone _____ State _____

A1	A17	A33	B15	B31	B47	B63	B79	B95	B111	B127	B143	B159	B175	C5	E10
A2	A18	A34	B16	B32	B48	B64	B80	B96	B112	B128	B144	B160	B176	C6	E11
A3	A19	B1	B17	B33	B49	B65	B81	B97	B113	B129	B145	B161	B177	C7	E12
A4	A20	B2	B18	B34	B50	B66	B82	B98	B114	B130	B146	B162	B178	C8	E13
A5	A21	B3	B19	B35	B51	B67	B83	B99	B115	B131	B147	B163	B179	C9	E14
A6	A22	B4	B20	B36	B52	B68	B84	B100	B116	B132	B148	B164	B180	C10	E15
A7	A23	B5	B21	B37	B53	B69	B85	B101	B117	B133	B149	B165	B181	D1	E16
A8	A24	B6	B22	B38	B54	B70	B86	B102	B118	B134	B150	B166	B182	E1	
A9	A25	B7	B23	B39	B55	B71	B87	B103	B119	B135	B151	B167	B183	E2	
A10	A26	B8	B24	B40	B56	B72	B88	B104	B120	B136	B152	B168	B184	E3	
A11	A27	B9	B25	B41	B57	B73	B89	B105	B121	B137	B153	B169	B185	E4	
A12	A28	B10	B26	B42	B58	B74	B90	B106	B122	B138	B154	B170	B186	E5	
A13	A29	B11	B27	B43	B59	B75	B91	B107	B123	B139	B155	B171	C1	E6	
A14	A30	B12	B28	B44	B60	B76	B92	B108	B124	B140	B156	B172	C2	E7	
A15	A31	B13	B29	B45	B61	B77	B93	B109	B125	B141	B157	B173	C3	E8	
A16	A32	B14	B30	B46	B62	B78	B94	B110	B126	B142	B158	B174	C4	E9	

☐ PLEASE SEND *TOOLING and PRODUCTION* TO ME REGULARLY AT THE ADDRESS LISTED BELOW

☐ PLEASE REMOVE MY NAME FROM THE *TOOLING and PRODUCTION* MAILING LIST.

☐ PLEASE CHANGE MY ADDRESS—

FROM — PLEASE FILL IN COMPLETELY — TO

Please print

NAME _____

TITLE _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

Please print

NAME _____

TITLE _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No postage Stamp Necessary If Mailed in the United States

3c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No postage Stamp Necessary If Mailed in the United States

3c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No postage Stamp Necessary If Mailed in the United States

3c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO

Inform-A-Gram Card Section

For fast service in obtaining further information about advertised and editorially featured products and informative literature, use these time-saving, postage-free INFORM-A-GRAM cards.

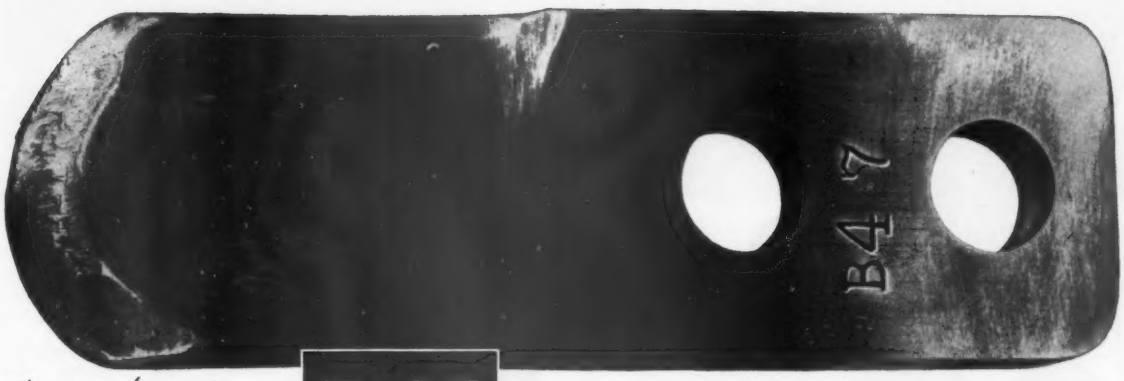
See reverse side of this space for easy-to-follow directions.

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY...

TOOLING and PRODUCTION
CIRCULATION DEPARTMENT
1975 LEE ROAD
CLEVELAND 18, OHIO



This punch gave double service!

This block had double life!

This die lasted 50% longer!

B-47 HOT WORK STEEL

gives you more runs for your money

. . . anywhere from 1½ to 5 times the Performance!

SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1½ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

SEND NOW

for "Blue Sheet" on Grade B-47

This four-page folder gives technical data on B-47 for brass extrusion dummy block and dies, valve extrusion die inserts, hot punch tools, forging die inserts, press forging dies, and hot work in general. *Write for your copy today.*

ADDRESS DEPT. TP-40

Looking for a better hot work steel? You'll find it in B-47—an improved chromium, tungsten, cobalt, vanadium type whose superiority is established by actual performance runs such as those summarized above. All tests show that B-47 has unusual resistance to shock and abrasion at elevated temperatures.

Developed originally for applications in the copper and brass industry, B-47 has given excellent results on difficult hot work jobs on steel. B-47, when properly heat treated, exhibits a well rounded combination of red hardness, toughness, and resistance to wear and heat checking that makes it a valuable addition to the Allegheny Ludlum group of hot die steels.

Put B-47 to the test. You'll find that it will do any number of severe hot work jobs without washing out or changing size. Get in touch with A-L, today. Let us help you to use B-47.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete MODERN Tooling, call

Allegheny Ludlum

WAD 3530

AL FINE TOOL STEELS SINCE 1854

4 jobs better with 1 basic tool!

FORD "Quad"

HSS chatterless countersink

Ford's exclusive job-engineered flute design, precise concentricity, greater rigidity, lower cost add up to faster production, better production, more profitable production. No secondary burs. Ideal for heavy duty applications. Write for details.

FORD "standard"

chatterless countersink

Engineered by Ford for peak operating efficiency commensurate with lowest possible initial tool cost. Ford's know-how makes possible a competitively priced tool without sacrifice of performance.

FORD -- *the complete line!*

HSS ground cutters, rotary files, countersinks
CARBIDE cutters, end mills, grinding burs

Complete Details, Operating Data

All specifications plus informative operational data on more than 300 FORD rotary tools contained in new FORD Catalogue No. 207. Write for yours!

FORD regrinding service adds tool life, reduces tool costs!

M. A. FORD MFG. CO., INC.

Pioneers in rotary tools for more than 30 years

DAVENPORT 4, IOWA

RING PUNCHES

•

HARD...
tough . . .
concentric . . .

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies

Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive Distributor Wanted for California

Ring Punch & Die Co.

108 FOOTE AVE., JAMESTOWN, N. Y.

Precision Plastic
OPTICAL COMPARATOR CHARTS

Send for catalog-price list
NO. 51-1952

Illustrating and pricing charts for every make and model of optical comparator and projector . . . radii, angles, American National, Unified-American thread form systems, Dryseal and other taper pipe threads, protractors, comparator scales and comparator accessories.

SPECIAL CHARTS AND FIXTURES BUILT TO ORDER

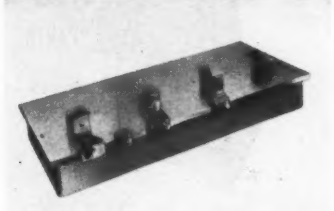
GAGE COMPANY

BATTLE CREEK, MICHIGAN

PROGRESS ON PARADE

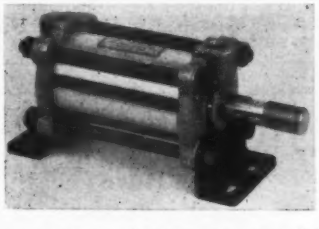
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS — Mail FREE Inform-A-Gram Card for MORE Details.

A Fully Integrated Inspection Unit incorporating all devices normally required for close dimensional checking is announced by Swanson Tool & Machine Products, Inc., Erie, Pa. The basic unit includes 5 fundamental checking tools — surface plate; bench centers; V-blocks;



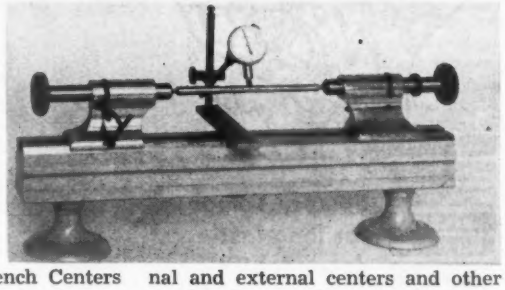
sine plate and indicator attachment —plus an exclusive concentricity attachment which permits rapid checking of relative diameters and bores in round or square parts of variable outside diameters. All attachments are automatically aligned and easily attached. The 60″ surface plate itself is available in 12″ or 24″ width, ground to .001″ or scraped to .00025.″ The bench centers will accommodate shafts to 48″ long and 8″ dia. The V-blocks have a 7¼″ diametrical capacity. The sine plate is hardened and ground tool steel 5″ by 2¾″. Optional accessories are also available for special purpose inspection. All wear parts are in hardened and ground tool steel, held to close tolerances. **Circle Inform-A-Gram No. A1.**

Double and Single Acting Air Cylinders have just been added to the products line of Bond Research Laboratories, Inc., 80-84 Winslow Ave., Somerville 44, Mass. Standard bore sizes are offered from 1½″ thru 6″, stroke lengths available



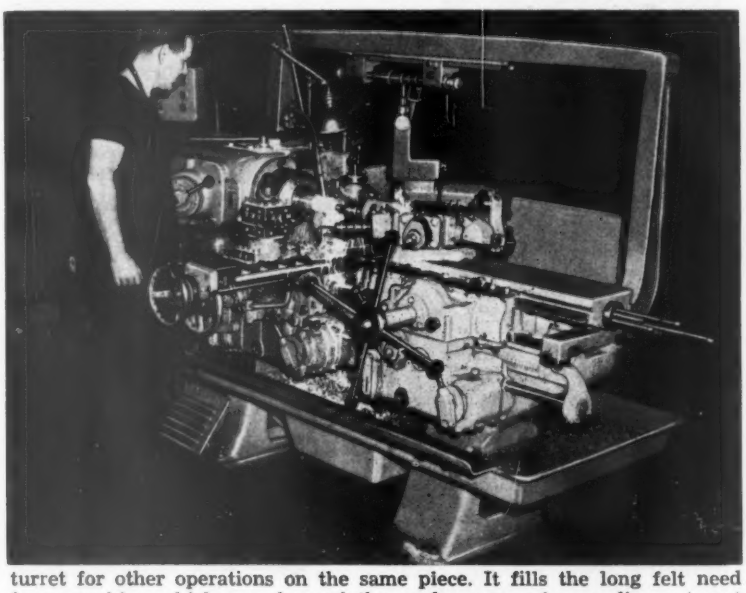
0″ to 24″ in increments of 1/32″. This line meets the most rigid operating conditions while insuring easy installation under the most crowded conditions without sacrificing compactness. Ideally suited for pressure ranges to 150 PSI. **Circle Inform-A-Gram No. A2.**

Illustration shows one of the two models of low priced portable bench centers which have recently been placed on the market by the Fearless Tool Company. They are precision made for rapid inspection with complete accuracy.



The New Fearless Bench Centers provide a very simple and extremely accurate setup for the rapid inspection of small parts. They are manufactured by watch tool makers to great accuracy and close tolerances. A precision dial indicator shows work runout. Work mounted on arbors can be rapidly checked radially for side run out or camming imperfections. Collet type center holders permit use of internal and external centers and other special fixtures between the quill heads. Various types of retractable spindles and accessories are available. Two models, offering 8″ and 14″ maximum center distances each take 3¼″ maximum work diameter. Detailed specifications from Fearless Machine Tool Company, 7045 Darby Avenue, Reseda, Calif. **Circle Inform-A-Gram No. A3.**

The Wraps Have Just Come Off this completely new turret lathe hydraulic tracing attachment. It is designed for exclusive use on any J & L ram or 7A universal bar or chucking machine for general tracing, multi-step shaft and contour work, and is powered by a differential type cylinder. The tool-carrying slide is mounted on a 45° angle with the spindle axis. The cylinder stylus and cutting tool are mounted on the back of the cross slide on a bridge type carriage, thus freeing the square



turret for other operations on the same piece. It fills the long felt need for a machine which goes beyond the performance of an ordinary turret lathe—yet requires less set-up time, and is admirable for small lot runs on multiple diameter and contour work. For turning tapers, a hardened straight edge is set at the desired angle and serves as a templet or former. In effect, all the known facilities of a turret lathe are made available on a profiling lathe. Fast stock hogging, threading, or any other operation can be accomplished without removing the piece. The tracer is switch-engaged. **Circle Inform-A-Gram No. A4.**

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Tomco

HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

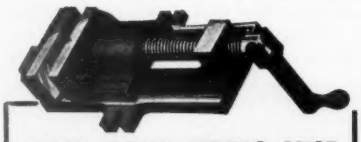
For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO

1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined - from stock



YOST DRILL PRESS VISE

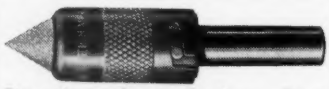
● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
Meadville • Pennsylvania



Abrasive Cent-R-Lap Tool

Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, 3/8" and 3/4" Cent-R-Laps and abrasive cones in leading grits.

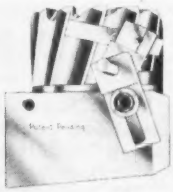
Write for descriptive literature and prices.

J. R. Reich Manufacturing Co.
45 E. Stroop Rd. Dayton 9, Ohio

Improved Diamond Tools Feature Rustproof Holders. From Diamonds & Tools, Inc., 19345 John R Street, Detroit 3, Mich., all tool holders in this improved line are surfaced with an oxide coating that resists

the corrosive action of coolants. 26 standard types are included in the new line, meeting the majority of dressing needs.
Circle Inform-A-Gram No. A5.

Conversion of a Surface Grinder into a cutter grinder is simple with this new fixture from Westcott Chuck Co., Oneida, New York, for grinding and sharpening the teeth of shell mills, side teeth of side



milling cutters and inserted tooth milling cutters. A few of the many advantages include overall simplicity of principal and operation, speed, accuracy, and versatility.
Circle Inform-A-Gram No. A6.

This Machine Drills 3840 Holes Per Hour of 3/16" diameter in a steel part, and was recently announced by the Govro-Nelson Co., 1933 Antoinette, Detroit 8, Michigan. It incorporates 8 #HH auto-

matic drilling units, electrically interlocked with automatic hydraulically operated clamping and indexing. Eight holes are drilled simultaneously at each of the four indexing positions.
Circle Inform-A-Gram No. A7.

for fast . . .
accurate . . .
engraving . . .

USE "PANTO"

Pictured above is the PREIS-PANTO Model 2D-4 Precision Engraving Machine for use on large metal or plastic panels, signs and name plates; steel stamps and dies or any product requiring precision engraving.

PANTO **Write for 2D-4 Bulletin and prices**

H. P. PREIS ENGRAVING MACHINE CO.
647 U. S. Route 22, Hillside, N. J.

KEYWAY CUTTING WITH GLENNY Adjustable push BROACHES

STRAIGHT ACCURATE KEYWAYS

NO SHIMS NO BUSHINGS

★ **Reduce Costs.**
★ **Eliminate Blade Breakage.**
★ **Use Under Arbor Press, Hydraulic Press, etc.**

(Also One Pass Broaches for Single or Multiple Keyways)

Write for literature

KASE MACHINE COMPANY
18572 BUFFALO AVE., CLEVELAND 19, O.

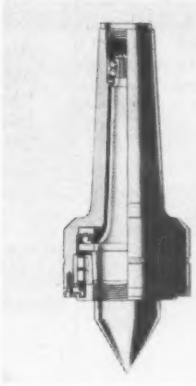
JIG BORING

We Have 12 Jig Borers

Including the largest Pratt & Whitney made

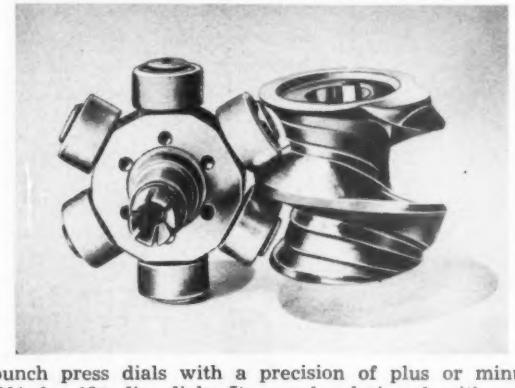
BLOOMFIELD TOOL CORPORATION
30 Farrand St. Bloomfield, N. J.

Cadillac "52" Air Impact Press has high speed, power and pressure for versatility in the marking field. Speed to 10,000 strokes per hour, pressure to 8 tons from 100# airline. Staking, crimping, riveting and light stamping operations are also easily accomplished. No jigs or fixtures are required for average work, and it is operated by hand, foot, or electrical controls. Data in bulletin A-52, Cadillac Stamp Co., 17315 Ryan Road, Detroit 12, Michigan.
Inform-A-Gram No. A8.



Heavy Duty SKF Ball & Roller Bearing Center. Two double row roller taper bearings provide radial support for the shaft, and a single row anti-friction bearing takes thrust loads and eliminates shaft movement in either direction. Shank bearings are of the unit construction double row angular preloaded type. Permanent lubrication. Ready Tool Co., 554 Iranistan Ave., Bridgeport 5, Conn.
Inform-A-Gram No. A9.

New High Speed Roller Gear Drive Development. The Ferguson roller gear drive is the result of fifteen years of research, provides a highly improved indexing or intermittent motion mechanism. It permits high speed, precision, design versatility and low maintenance on any applications such as indexing dials, carriers, conveyors and mechanisms. Piece speeds to 800 pieces per minute are attained to extremely close tolerances and without auxiliary locating mechanisms. The drive is standard equipment on the V & O Press Co.'s high speed notching press, and can be used for



punch press dials with a precision of plus or minus .001 for 12" dia. dials. It may be designed with any number of stops from 2 to infinity, and the indexing period may vary from 25%-100% of total cycle time. Either right or left hand rotation is available. The drive life without maintenance is 8,000 hours where extreme precision is required, and up to 20,000 hours where it is not. Ferguson Machine & Tool Co., Inc., 471 Paul Ave., Ferguson 21, Mo. **Circle No. A10.**

The ARBOR PRESS

You've Been Looking For!

It's the new Manzel 10 Ton Hydraulic Arbor Press...engineered to meet a variety of needs in manufacturing plants and automotive service stations. The long ram stroke and unusual depth and width of throat make it adaptable to straightening, material testing, bending, bearing or bushing work, and many other uses. Gauge is optional.

The press is portable...or can be permanently mounted on bench, column, or wall. Power unit operates 3 times faster. Ram is self-retracting.

Write today for complete information.

Jobber inquiries welcome

Manzel

315 Babcock Street
Buffalo 10, N. Y.

There's a reason 76% *

of all popularly-priced Tool and Cutter Grinders sold in 1952 were "Knock-Outs"

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

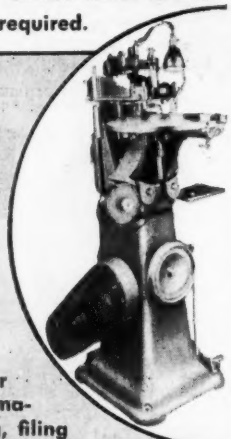
Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN S. D.

* SALES STATISTICS FURNISHED ON REQUEST

Toolroom Efficiency Increased . . . Precision Assured With OLIVER DIE MAKING MACHINES

Speedy and Accurate They Effect Savings in Time and Costs Up to 60% . . . yet they're so simple to operate skilled labor is not required.



OLIVER OF ADRIAN

The Oliver Method for machine sawing, filing and lapping operations has proved itself for more than 40 years in thousands of plants throughout the world. Built to give long-lasting, efficient service, many Oliver Die Making machines have been in continuous use for more than 25 years.

OLIVER DIE MAKERS Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

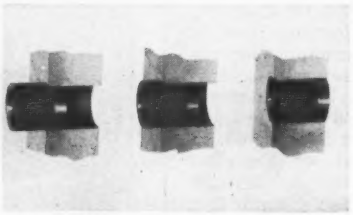
Write Today For Complete Technical Data on OLIVER DIE MAKERS

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include: AUTOMATIC DRILL GRINDERS, TOOL & CUTTER GRINDERS, DRILL POINT THINNERS, TEMPLATE TOOL GRINDERS, FACE MILL GRINDERS, DIE MAKING MACHINES

OLIVER INSTRUMENT CO.
1436 E. MAUMEE · ADRIAN, MICHIGAN

Need For High Precision where thin wall bushings are specified is eliminated with the new broach-fit bushing by Aeroquip Corp., Jackson, Michigan. Hole tolerance requirements reduced from .0005" to

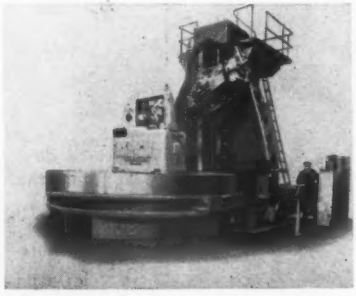


a maximum of .002". Illustration shows the three stages of fitting, pilot entry; bushing cutting into position; locked final stage.
Circle Inform-A-Gram No. A11.

Additional Air-Operated Impact Wrenches in two sizes have been added to the line of the Master Pneumatic Tool Co., Inc., Krick Rd., Bedford, Ohio. For driving al-

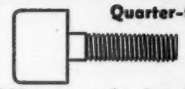
most all threaded fasteners in assembly and sub-assembly operations, one model has capacity for ⅝" dia. bolts, and the other for ¾" bolts. Maker has all data.
Circle Inform-A-Gram No. A12.

A Complete Line of Gear Hobbing Machines by David Brown Machine Tools Ltd., England, are now available in the U. S. through Morey Machinery Co., Inc., 410 Broome St., New York 13. They are available in sizes from 15" to 240" —and include universal gear hob-



bers; pinion hobbing machines; production hobbing equipment and relieving lathes. The illustration shows a 15" gear hobber, the smallest size, perched on the table of a 240" machine, believed to be the world's largest. David Brown-Muir experience covers some 110 years in machine tool production.
Circle Inform-A-Gram No. A13.

REID TOOLING AIDS

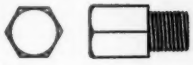


Quarter-turn Screws, assorted sizes.

T-Nuts, case-hardened for all standard T-slots.

Coupling Nuts, case-hardened.

Studs — also T-slot bolts.



Jig feet or rest buttons — hexagon and circular.

Also hand wheels, machine handles, levers, cranks, fixture units, magnetic parallels, machine vises, cast iron knobs. Write for catalog and prices on complete REID line.

REID TOOL SUPPLY CO.
709 Baker St., Muskegon Heights, Michigan

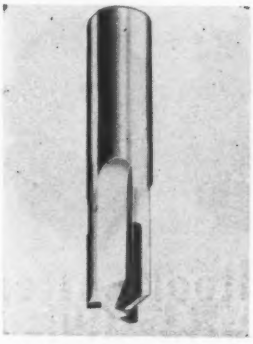
CEMENTED CARBIDE

Drilled, Tapped, Threaded, Broached within tolerances of .001 of specifications. Hardest man-made metals accurately machined save thousands of $$$ in all types of tool and die work. Die revisions, corrections machined in hardened state with no material change. All work guaranteed. Write for details.

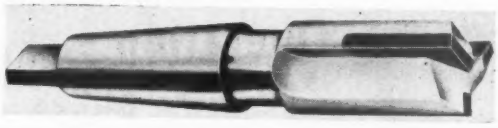
Arc Machining, Inc.
732 N. Rochester Rd.
Clawson, Michigan

HARDNESS TESTING
has been done with the
SCLEROSCOPE
since 1907

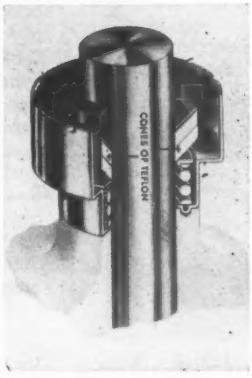
THE SHORE INSTRUMENT & MFG. CO., INC
90-35 Van Wyck Expressway
Jamaica 35, N. Y.



Super Adds Penetrating End Mill. New three fluted, center cutting carbide tipped end mill has been added to the line of standard carbide tools of Super Tool Co., 21650 Hoover Rd., Detroit 13, Michigan. It is specifically designed for non-ferrous metals and non-metals, is capable of penetrating end cutting as well as routing etc. Catalog #129.
Inform-A-Gram No. A14.

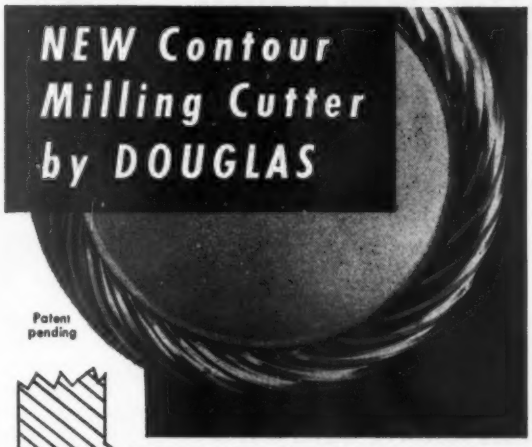


New Mechanical Seal gives long service life in rotary shaft applications. By Dept. T-12, Crane Packing Co., 1800 Cuyler Ave., Chicago 13, it uses special beveled cones of Teflon (DuPont Trademark for tetrafluoroethylene resin) as the flexible member. This adapts the seal for service with water, oil, corrosives, temperatures from −100° to +450°F, high speeds, and 200 psi pressures.
Inform-A-Gram No. A15.



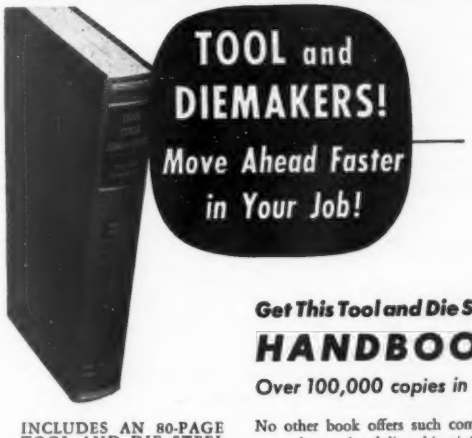
A Universal Lead Measuring Instrument is a recent addition to the line of precision devices manufactured by the Sheffield Corp., Dayton 1, Ohio. It accurately determines the lead of external and internal threads of work parts up to 8" dia. and 18" in length. The base supports a fixed headstock at the right end, with a tailstock at the other. The headstock, besides mounting the centers, carries what is virtually the barrel of

a specifically constructed micrometer. The tailstock can be used in either of the two runways to accommodate work of various diameters, and may be locked in any position. The amplifying and indicating unit (magnification 400-1) is carriage mounted and can be traversed longitudinally and locked in any desired position. Small residual lead errors which may be present are corrected by a compensating attachment. Full data from maker. **Circle Inform-A-Gram No. A16.**



Here is the patented, high helix, shear type milling cutter that does a real job on turbine compressor blades, stator vanes, buckets and nozzles, cam generating or any compound contoured surface. The teeth are always in contact with the work, they clean themselves and impart a smooth finish. Douglas milling cutters, by using a special adapter, will fit any milling machine. Standard sizes 1½" to 3½". Other sizes upon request.

DOUGLAS TOOL CO. 2300 E. Nine Mile Road Hazel Park, Mich.



Get This Tool and Die Steel
HANDBOOK
Over 100,000 copies in use!

INCLUDES AN 80-PAGE TOOL AND DIE STEEL SELECTOR alphabetically arranged for fast, dependable selection of the proper steel for every tool and die.

564 pages
355 illustrations
PRICE ONLY **$2.00**

No other book offers such complete, up-to-date tool and diemaking information. "Tool Steel Simplified" covers everything from selection of the right steel to heat treating methods and equipment. Valuable facts on how design affects heat treatment, hardenability tests, heat treating time, furnace atmosphere, trouble-shooting.

The Carpenter Steel Co., Dept. 9, Reading, Pa.
Please send "Tool Steel Simplified" at low price of $2.00. Check or money order enclosed.

NAME
ADDRESS
CITY ZONE STATE

STOP SCALE AND DECARBURIZATION THE EASY WAY!!

3 BIG ADVANTAGES PROVE

PHOENIX BRAND
TRADE MARK REG U.S. PAT OFF

NON-SCALING COMPOUND

THE PERFECT METHOD FOR HEAT TREATING TOOL STEELS AND ALLOY STEELS UP TO 1650°F!

SAVES TIME!

Simply coat piece to be treated — then harden or anneal as usual. It's that quick! This dry, easy-to-handle powder is applied in a jiffy — saves hours of costly finishing.

IMPROVES RESULTS!

Each finished piece is a shining example of production excellence. Phoenix Brand Non-Scaling Compound seals air out — assures *bright, pitless, scale-free* surfaces every time. Protective coating is removed in a flash — if necessary, just boil in plain water.

SAVES MONEY!

Polishing and grinding are virtually eliminated! Rejects are reduced! Furnace capacity and production increase — there's no cumbersome packs to crowd furnace.

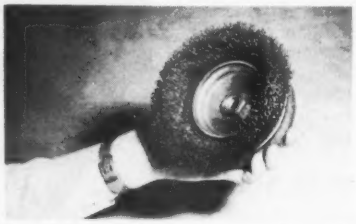
Prove to yourself that Phoenix Brand Non-Scaling Compound can end your heat treating headaches for good — order a trial supply TODAY!

2 Lb. can ..... $ 6.00
5 Lb. can $15.00
15 Lb. can $41.25
25 Lbs. or more... $ 2.50 per Lb.

Available from your local distributor or

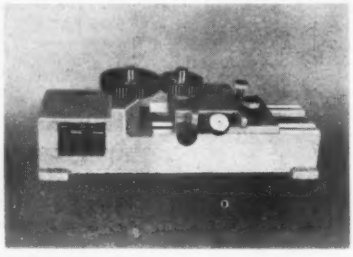
THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

A New Wire Cup Brush with replaceable filler for the removal of rust, scale, paint and welding slag from metal surfaces has been developed by Hewitt-Robins Inc., Buffalo 5, New York. Inner and outer



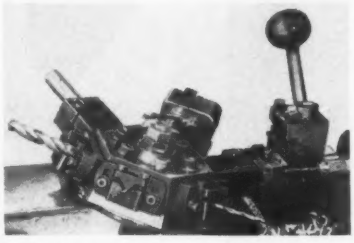
metal adaptors grip a replaceable cup-type filler in which the wire bristles are anchored in place with rubber. **Inform-A-Gram No. A17.**

New #602 Bench Rolling Fixture by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Michigan checks size, eccentricity and roll smoothness of spur and helical

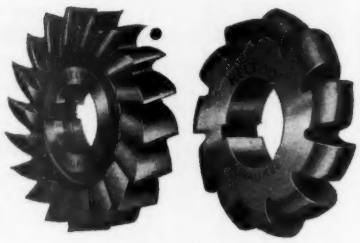


external gears. Center distance is adjustable from 2 to 10 inches. The unit features a heavy cast iron base, scraped ways and hardened and ground ball ways.
Circle Inform-A-Gram No. A18.

Perfect Tool Alignment every time and on the first try is guaranteed by the Brookfield tool holder, two new models of which have recently been added. From Brookfield, Inc., 755 Boylston St., Boston 16, Mass., the three models in the range will now cover any diameter



tool from 1/64" to 3/4". One, the model DB, has exceedingly compact body dimensions for use in B & S and similar machines where work tolerances are exceptionally close. Ideal on turret lathes, drillers, cutters and reaming machines, it is also useful for second operation work on surface and cylindrical grinders. **Circle No. A19.**



a Reltool Cutter for Every Milling Operation...

Reltool offers a Full Range of Milling Cutters in all Types and Sizes for every standard milling operation, and for many special applications. This includes Keyseat Cutters — both Shank and Arbor Types; Plain and Heavy Duty, Side and Half-Side, Staggered Tooth, Helical, Angle, Shell End, Single- and Double-Angle, T-Slot-Straight and Taper Shank, Dovetail — 45° and 60° Angle. Convex, Concave and Corner Rounding Milling Cutters are available in both the Old Standard and in the New M.C.T.I. Standards.

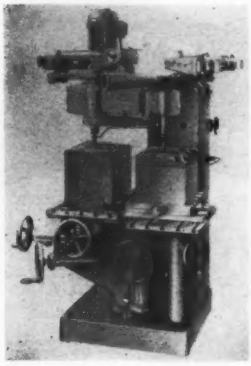
The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.
A-5947-½-R

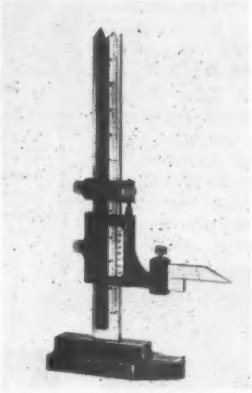
LAYOUT FLUID
FOR ANY METAL

Scribed lines are easy to see against the dark blue background. Speeds up layout work and cuts costs. Merely wipe surface clean and brush on layout fluid. *Dries instantly.* Write on your company letterhead for free sample. Advise us if your local supply house doesn't carry.

DAYTON ROGERS
Manufacturing Company
2833 13th Avenue, South
Minneapolis 7, Minnesota

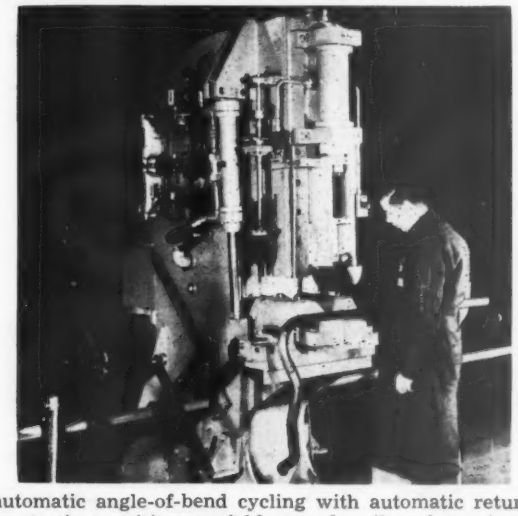


Universal Pantograph Die Sinking Machine. Model KF12, by Cosa Corp., 405 Lexington Ave., New York City, performs an extremely wide range of copy milling operations from heavy die sinking to light engraving. Capacity is such that the tool covers an area of 15¾" x 15¾" in a single setup even with die blocks to 15¾" high. Spindle speeds infinite from 60 to 10,000 rpm. **Inform-A-Gram No. A20.**



Here is a New Model High Precision Vernier Height Gage. Construction is of unusually substantial tool steel with high grade satin chrome finish. It has a long double vernier scale, one side graduated in thousandths of an inch, the reverse side in fiftieths of millimeters. Offset scriber and dial holder. Furnished in 12", 18", 24" and 36" sizes. Brand Tool Company, 307 So. Victory Blvd., Burbank, Calif. **Inform-A-Gram No. A21.**

New 20 Ton Hydraulic Pipe & Tube Bending Press. Just announced by Pines Eng'g Company, Inc., 601 Walnut St., Aurora, Ill., this new press is designed with unusual working clearance to speed handling of multiple bends in different planes. The press is a fully hydraulic, self-contained unit with a rated capacity of 20 tons. Outstanding design features include twin equalizing cushion cylinders offset on the press frame;

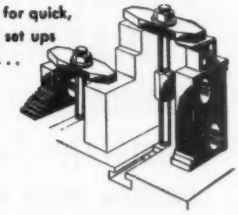


automatic angle-of-bend cycling with automatic return to starting position; variable speeds; oil coolers; single screw adjustment for wing dies; movable foot control and shortened die holders for maximum clearance. The unit has adequate power and capacity for repeat bending of ½" thru 2" OD steel tubing size with a max. wall thickness of .083" without excessive distortion. Clearance is provided to bend 2" tube with centerline radius of 5" to 180°. **Circle Inform-A-Gram No. A22.**

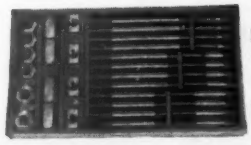
Step up Production with TTCO **SURE GRIP STEP BLOCKS**

FOR MILLERS — SLOTTERS
JIG BORERS — PLANERS
RADIAL DRILLS — LATHES

. . . used for quick, accurate set ups like this . . .



and **HANDY STUD SETS**



Stud sets consist of 40 pieces and provide requirements for at least 4 clamps from 3" to 15" high with T nuts for your table slot.

there's a size to fit your machine

write for free illustrated catalog

TIETZMANN TOOL CORP.
315-317 N. MAIN ST. • DEPT. A • ENGLEWOOD, OHIO

famco OFFERS A COMPLETE LINE OF **15" DRILL PRESSES**

Today's Best Drill Press Value

No. 80 Single Spindle, Tilting Table, Bench Model, (shown with motor). Famco Drill Presses are available in a complete line of single and multiple spindle models, bench and floor types.

Here Are a Few of Many Famco Features:

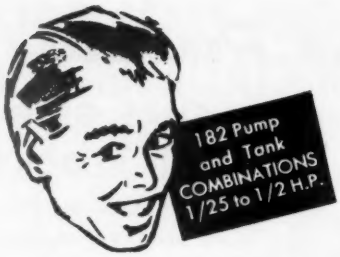
- Heaviest machine in the price field.
- Precision machined throughout.
- Extra-large (2-3/64") quill (largest in price field); greater rigidity, accuracy.
- Extra-long (4½") stroke with shorter spindle means greater bearing support.
- No. 70 to ½" Jacobs Chuck or No. 1 Morse Taper.
- Four sealed-for-life ball bearings.
- Full-tilting, precision-ground table.
- Quick release motor bracket mounting, (furnished as standard equipment,) permits belt changes without moving motor.
- Easily adjustable feed tension control.
- Six spline spindle provides constant power and greater rigidity.
- Wide range of spindle speeds.

Write for free illustrated Catalog

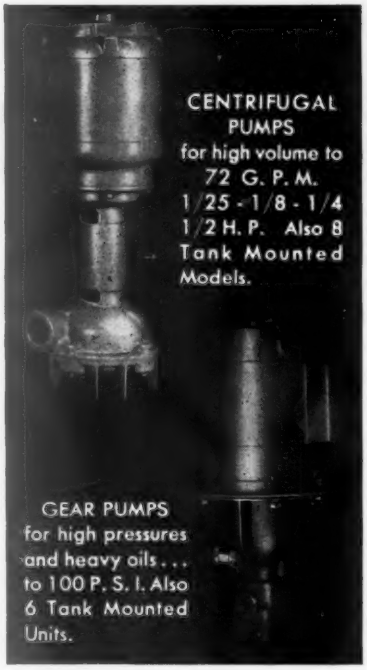
FAMCO MACHINE CO. • 3124 Sheridan Rd., Kenosha, Wis.

famco (COST CUTTING) **machines**

ARBOR PRESSES ★ DRILL PRESSES ★ POWER PRESSES ★ FOOT PRESSES
SQUARING SHEARS ★ BAND SAWS ★ AIR PRESSES



Standard Models of GRAYMILLS Coolant Pumps and Complete Systems ANSWER MOST OF YOUR MACHINE TOOL NEEDS.



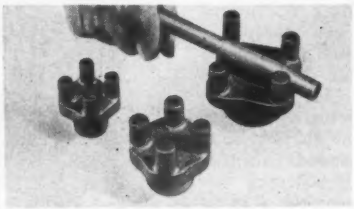
Send for new GRAYMILLS catalog with easy to use pump selection chart.

Industrial Distributors Stock Standard Models

GRAY-MILLS

GRAYMILLS CORPORATION
3713 North Lincoln Avenue
Chicago 13, Illinois

Hand Bar Speed Knobs have been added to the standardized component line of the Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio. They provide greater tightening and clamping ac-

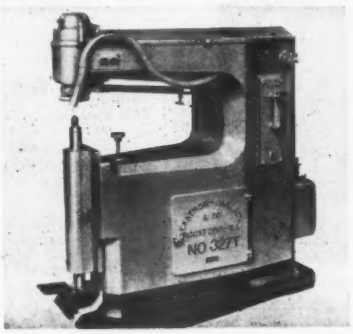


tion by simple leverage applied between the prongs. In malleable iron; covering a wide size range. **Circle Inform-A-Gram No. A23.**

Longer Wear with Less Bronze is feature of OK wear strips, by the Ohio Knife Co., Dept 34, Dreman Ave., Cincinnati 23, Ohio. A special bi-metal weld reduces bronze requirements, and aluminum rather than cast phosphorous bronze is used because of its su-

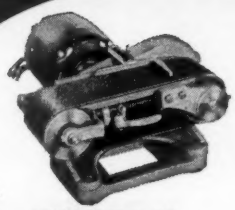
perior wearing characteristics. The soft steel base is readily machinable for required drilling, tapping, and machining to thickness. **Circle Inform-A-Gram No. A24.**

Ideally Suited for Trim Routing large and difficult-to-handle nonferrous sections, the #327-T trim router by Ekstrom, Carlson & Co., Dept. M-16, 1400 Railroad Ave., Rockford, Ill., has 2 spindle speeds of 10,000 and 20,000 rpm, and three alternative motors to 7½HP. Di-



mensions include 27¾" throat clearance and floor to guide pin holder height of 32¾". Available distance between guide pin holder and spindle face is 3"-9¼", with 6¼" max. stroke. **Circle Inform-A-Gram No. A25.**

DOES IT BETTER
DOES IT FASTER



SIMPLEX-M
ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

Look to SID TOOL for your complete requirements

A.S.A. STANDARD
American DRILL JIG BUSHINGS
In Stock!

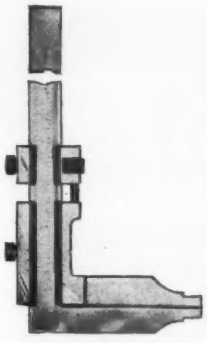
We maintain the largest and most complete stocks of AMERICAN Drill Jig Bushings in the East . . . Hundreds of types and sizes, including specials to your specifications. IMMEDIATE DELIVERY! Catalog and prices on request. Let us put you on our monthly mailing list!

SID TOOL COMPANY, INC.
CUTTING TOOL SPECIALISTS
126 LAFAYETTE ST.
NEW YORK 13, N. Y.
BEekman 3-4270

NEW NESTING TYPE
TOTE PANS

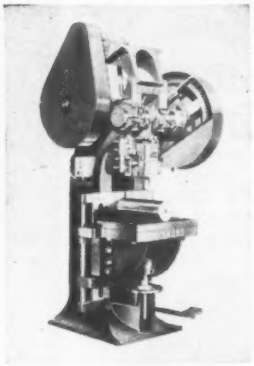
Sturdy 16 ga. metal. 20" long x 12" wide x 6¼" deep. Drag holes and handles at both ends.

J. L. LUCAS & SON, INC.
Bridgeport 5, Conn.

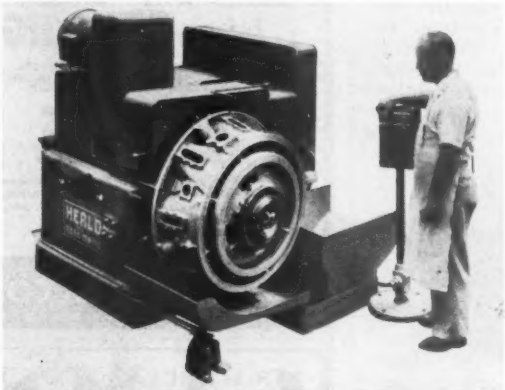


Vernier Slide Calipers from Schweitzer, the best known maker in the U. S. Zone of Germany, are now available from Glogau & Co., Inc., Dep't D, 1914 Birchwood Ave., Chicago 26, Ill., in sizes from 10" - 96". Hardened chrome steel, machine divided graduations, settings in English measure to 1/1000th inch. Jaws are hardened, lapped and ground, and vernier slides fitted tightly and smoothly. **Circle Inform-A-Gram No. A26**

New 40 Ton Horn Press by Diamond Machine Tool Company, 5111 Coffman-Pico Rd., Pico., Calif., features a heavy-duty frame and easy adjustment, is manufactured either plain or geared. Major specifications include dia. of shaft at main bearings 3½"; table to ram die height of 6"-18" and to center of horn hole of 8"; stroke 3"-6" and strokes per min. 50-100. **Inform-A-Gram No. A27.**



Special Way-Type Bore-Matic Borizes Jet Part. An excellent example of the versatility of the Heald precision boring machine is this 331 Bore-Matic by the Heald Machine Co., Worcester 6, Mass. It is equipped with a vertical indexing eight-station fixture. The low mounting position of the fixture on the way unit facilitates the handling of heavy awkward parts. Indexing is hand operated with location controlled by an air operated locator pin actuated by a foot valve. Tooling mounted on a #218 boringhead includes cross feed unit. In-stroke operations consist of turning and plunging a chamber, table hits positive stop and the

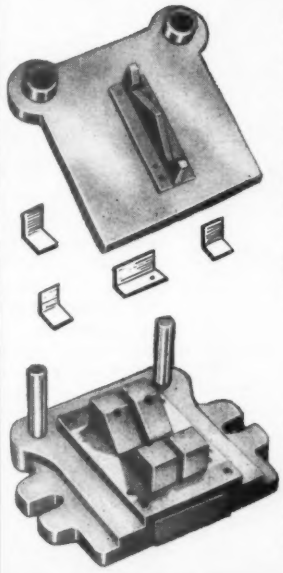


cross feed operated with the tools forming and blending two radii and generating a face.

The table is interlocked with the cross feed unit so that it will not start the outstroke until all tools on the cross feed are clear of work. Also, table is interlocked with fixture so that cycle cannot be started until the part is properly indexed. A pedestal push-button control panel allows operator to control machine at point close to loading station. Cycle is completely automatic after "table in" button is depressed. **Circle Inform-A-Gram No. A28.**

Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

—or what have you?

What are your punch and die needs? Consult us about those problems. *Satisfaction is your reward when you Re-WARD your orders.*

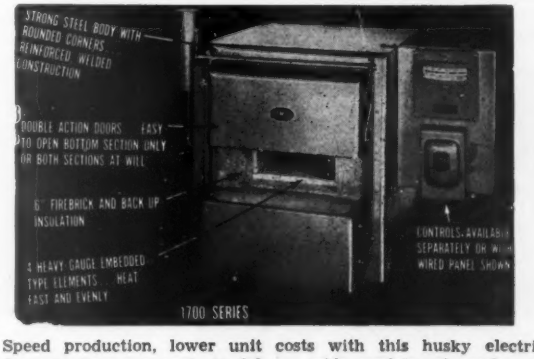
Send for free illustrated catalog No. 152 AA. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CUT HEAT-TREAT COSTS

. . . with this versatile Temco bench furnace

. . . for heat-treating dies, parts, tools, etc.


STRONG STEEL BODY WITH ROUNDED CORNERS REINFORCED WELDED CONSTRUCTION
DOUBLE ACTION DOORS EASY TO OPEN BOTTOM SECTION ONLY OR BOTH SECTIONS AT WILL
6" FIREBRICK AND BACK UP INSULATION
4 HEAVY GAUGE EMBEDDED TYPE ELEMENTS HEAT FAST AND EVENLY
CONTROLS AVAILABLE SEPARATELY OR WITH WIRED PANEL SHOWN
1700 SERIES

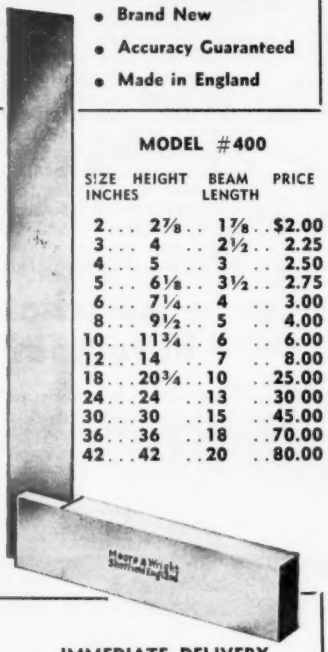
Speed production, lower unit costs with this husky electric furnace. Large enough to take a wide variety of work, yet compact and exceptionally convenient to use. Chamber sizes—9½" wide, 8½" high and 13½" or 18" deep. Heating range 350° to 1900° F., 220 V. operation. Price with controls, $297.50 to $507.50. Furnace only $235 to $285. Write for literature and nearest dealer's name.

TEMCO® ELECTRIC FURNACES

Thermo Electric Mfg. Co., 474 Huff St., Dubuque, Iowa

PRECISION GROUND
Production Engineers' Square
HARDENED BLADES

- Brand New
- Accuracy Guaranteed
- Made in England



MODEL #400

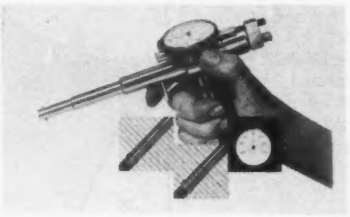
SIZE INCHES	HEIGHT	BEAM LENGTH	PRICE
2	2⅞	1⅞	$2.00
3	4	2½	2.25
4	5	3	2.50
5	6⅛	3½	2.75
6	7¼	4	3.00
8	9½	5	4.00
10	11¾	6	6.00
12	14	7	8.00
18	20¾	10	25.00
24	24	13	30 00
30	30	15	45.00
36	36	18	70.00
42	42	20	80.00

IMMEDIATE DELIVERY FROM STOCK!
Up to 12" size supplied in wooden box. 18" size and over supplied in strong wooden sheaths.
Ask for new catalog!
DE WITT EQUIPMENT CO.
132-136 Lafayette St., New York 13, N. Y.
Telephone: WAlker 5-4048

Miccro Supreme
LAY-OUT AND IDENTIFICATION DYE

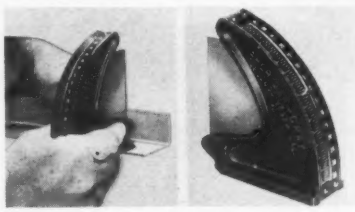
7 COLORS
For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.
MICHIGAN CHROME & CHEMICAL COMPANY
6340 E. Jefferson Ave. • Detroit 7, Mich.

New Groove Gage for Small Diameters is now available from Rimat Tool Co., 21 West Dayton St., Pasadena 2, Calif. It is typical of the new line of "P" gages made by the company, in standard models small enough to enter a .310" bore



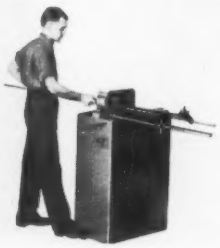
and measure groove diameters for "O" ring AN6227-6; snap ring groove NAS-50-31. **Circle No. A29.**

A Unique Protractor for measuring angles on sheet metal parts is now being produced by the Sheridan-Gray, Inc., 405 Via Chico, Palos Verdes Estates, Calif. Ca'led "Angle-Chek", this device permits



quick checking of angles formed on parts by equipment such as hydraulic presses and brakes. Accuracy is within plus or minus five minutes. **Inform-A-Gram No. A30.**

Di-Acro Power Rod Parter for speedily and accurately cutting rods and bars from 1/16" to 5/8" without burr and distortion is announced in improved form by O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn. Principal improvement is the replacement of



an air operated power unit by motor driven flywheel. Operating at 180 strokes per minute, this drive provides six times the cutting speed previously available. A special gage supplied as standard equipment allows the separate operations of gaging, ejecting and cutting to be performed in one cycle. Materials can be "parted off" as fast as the operator can feed stock and operate the clutch. **Inform-A-Gram No. A31.**

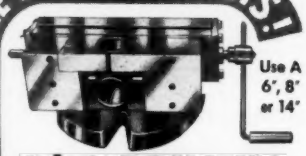
Over 85% of the torque wrenches used in industry are
STURTEVANT TORQUE WRENCHES
Read by Sight, Sound or Feel.

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.
PA STURTEVANT CO

BOOST PRODUCTION and REDUCE TOOLING COSTS!

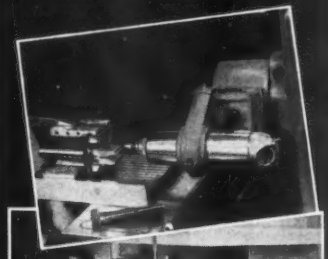


Use A 6", 8" or 14"
John's DRILL JIG
with your present machine tools.
Assures faster, more accurate
DRILLING • TAPPING
MILLING • REAMING
CENTERING • BORING
Minimum set-up time. Quick interchangeable jaws and bushing plates. Fast (upward or downward) chucking, precise centering, rigid clamping. Chips on these jigs cannot collect to interfere with operation. High hourly production rate.
WRITE FOR DETAILS
Manufactured by
HEUSER MFG. CO.
1638 N. Paulina St., Chicago 22, Ill.

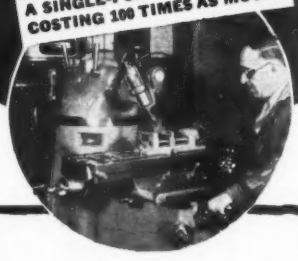
CAMS
Made to Your Specifications
Let Us Handle Your Cam Problems
BLOOMFIELD TOOL CORPORATION
30 Farrand St. Bloomfield, N. J.

LOWEST COST PRECISION

FOR TOOL ROOM AND PRODUCTION



ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!



Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¼ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. *High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters.* PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.

Write FOR CATALOG

PRECISE PRODUCTS CORPORATION

1341 CLARK ST. • RACINE, WIS.

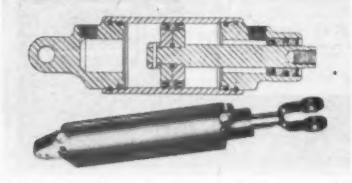
Precise

GRINDER-MILLERS

Efficient for both Heavy & Light Operations, the portable #127 power tool by Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill., handles grinding and drilling, and with attachments, as model

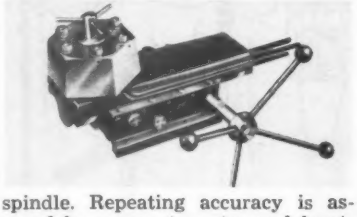
#127PS, polishing and sanding. Features include spindle speed 500 rpm, self-lubricating bearings, geared chuck. **Circle No. A32.**

Improved Key Type Pneumatic Cylinder by Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill., has many desirable features. Cartridge rod bearing unit can be replaced



without disassembly of the unit, and considerably reduces misalignment wear. General construction combines compactness and serviceability with sound engineering. **Circle Inform-A-Gram No. A33.**

"Tilt-Head" Bed Turret. This new design makes it possible to swing tools as large as 6" dia. over the ram and also gives working travel of 7¼". Because of this greater clearance factor, a wide variety of tooling can be used. However, on the working stroke tools are always in perfect alignment with the



spindle. Repeating accuracy is assured by a new type tapered locating pin which works in a sleeve bearing and locates in a mating seat. The long working stroke is a feature rarely found on a turret of this size and price range. Through a clutch arrangement operation can be either automatic or manual. For most 10", 11", and 12" lathes. A. K. Tool Company, 2029 Blake Ave., Los Angeles 39, Calif. **Circle Inform-A-Gram No. A34.**

SOUTH BEND 10"-1" COLLET LATHE

Precision-Built FOR *Precision Work*

The precision, speed and versatility of this lathe assures efficient output on toolroom or exacting production work. Precision-built throughout, close tolerances can be consistently held with minimum effort and no sacrifice of output. Its large collet capacity, wide ranges of feeds and speeds, and numerous available attachments will enable you to keep it busy on a variety of jobs. *Write for literature...* also 9" to 16-24" Lathes, 7" Shapers and 14" Drill Presses.

SPECIFICATIONS:

Swing—10⅛". **Spindle Bore**—1⅜". **Center Distances**—4, 14¾ to 34¾". **Spindle Speeds**—12, 50 to 1357 r.p.m. **Longitudinal Feeds**—48, .0015 to .0836". **Cross Feeds**—48, .0006 to .0309". **Thread Cutting**—48, 4 to 224 per inch.

SOUTH BEND LATHE

South Bend 22, Indiana

Building Better Tools Since 1906

South Bend Lathes

"Pete just won't talk with any one but a Columbia man since he hit a production high with SUPERDIE."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels—High Speed Steels Die Steels—Hot Work and Shock Resisting Steels Carbon Tool Steels.

TOOL COLUMBIA STEELS

. . . Maintenance, from page 119

losses, we made a lubrication survey at each of our plants and then developed lubrication standards which have resulted in the use of a standard list of lubricating oils and greases, scheduled frequencies for lubrication, standard fittings, and the use of centralized and automatic lubrication equipment.

When new equipment is manufactured or purchased, lubrication decals indicating type of oil and frequency of lubrication are applied to all the lubrication points so that the oiler can follow a simple color code for all of the lubrication.

Since lubrication of machinery and equipment is scheduled as part of the preventive maintenance program we have made every effort to train our oilers so that they are fully familiar with the lubricants and the lubrication procedures.

As an oiler has the opportunity to examine a great deal of equipment during his tours we have them make out a report on equipment that appears to be overheated or vibrating, or having loose bearings, oil leaks, etc. This information is of great value to the Plant Engineer and occasionally is responsible for preventing a breakdown.

Weekly Meetings

In our plants, the maintenance department has found it extremely valuable to have a weekly maintenance conference on Thursday afternoons. They review work performed the previous week and plan the maintenance schedule for the weekend and the week.

These weekly meetings have been especially beneficial in plants where the production department supervisors are invited to attend. The Plant Engineer reviews the status of work orders submitted by each of the production departments and the conference gives everyone opportunity to contribute to the maintenance effort.

. . . *Continued on page 154*

KNU-VISE pliers help speed aircraft production

Twenty-two Knu-Vise toggle-action pliers accompany this huge aircraft assembly jig when delivered to a prominent airplane manufacturer. The pliers play an important part in attaching longerons and aluminum angles to section of fuselage.

This job shows one of the countless ways in which Knu-Vise pliers and clamps are used to facilitate production.

Three Knu-Vise models selected for their high efficiency in specific operations: P-400, P-1200, P-1800.

Photo, courtesy of Banner Die & Fixture Co., Detroit.

KNU-VISE PRODUCTS LAPEER MFG. CO.
3064 DAVISON ROAD • LAPEER, MICHIGAN

ONE Tool
ONE Set Up

. . . for boring, facing, turning, recessing, undercutting.

MASTERHEAD

THE BORING HEAD THAT THINKS FOR ITSELF

Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; seven models for work up to 24" diameter.

Send for Illustrated Literature

KARL A. NEISE 381-4th Ave., Dept. TP. New York 16, N. Y.

CHICAGO **DIES**

Complete Line of PUNCHING and FORMING DIES for All Sizes and Makes of PRESS BRAKES

4392

DREIS & KRUMP MANUFACTURING COMPANY
7428 S. Loomis Blvd., Chicago 36, Illinois
CHICAGO STEEL BINDING BRAKES, BOX and PAN BRAKES, PRESS BRAKES

Use KIPP AIR GRINDERS *if you want to GRIND —not just rub!*

MODEL JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Reality* High Speed AIR TOOLS

Trade Mark

NOW ...an even Stronger

MICRO-MINIATURE

IN STUB LENGTH

Save Small End Mill Breakage

- Strength
- Faster Cutting
- Long Life
- Polished Flutes

PRECISION GROUND FROM SOLID

EASTERN DISTRIBUTORS

KARL A. NEISE, 381 Fourth Avenue, New York 16, N. Y.
MATERIAL SALES CO., 14438 W. Warren Avenue, Dearborn 1, Michigan
MIDLAND ENGINEERING & SUPPLY CO., 7516 W. Belmont Ave., Chicago 34, Illinois

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif. *Write for Catalog*

HIGH SPEED CARBIDE

Severance

MIDGET MILLS CHATTERLESS COUNTERSINKS

SPECIAL CUTTERS—REGRINDING SERVICE

ASK FOR OUR GENERAL CATALOG

Severance Tool Industries Inc.

730 IOWA AVE., SAGINAW, MICHIGAN

Specify DESTACO SHIM STOCK

Made from selected steel or brass, rolled to precision limits, oiled to resist stain and rust, free from burrs. Twelve assorted thicknesses .001" to .015", sheets 6" x 12"; coils 120", identified every 6" by thickness and amount remaining on roll.

DESTACO DETROIT STAMPING COMPANY

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

THE KOCH TEST INDICATOR

IS THE ONLY TOOL MAKERS INDICATOR ON THE MARKET WITH TWO WORKING ENDS, FOR PRECISION WORK, ONE END TO TEST OUTSIDE SURFACES, THE OTHER INSIDE.

WHAT EVERY TOOL ROOM TOOL MAKER OR MACHINIST NEEDS.

Plunger moves away from, instead of against the lever, protecting delicate parts from sudden or excessive jolts. Each graduation on scale represents 1/1000" movement of plunger. $7.50 plus postage.

Positive-Lock SURFACE GAGE

Drawbolt has positive lock to prevent slippage. Spindle: 9"x5/16". Block: 3¼"x2½"x1" with 90° angle groove in base. Surface Gage is precision ground. $8.75 plus postage.

Ask your dealer for these tools and buy through him. If he cannot furnish them, Write to us.

ANDREW GENALES, NYACK, N.Y.

A-28 Second Ave. Tel. Nyack 7-2222

Blast Cleaning Eliminates Paint Peeling Problem

By switching from pickling, power sanding and hand methods of cleaning to blast cleaning, Vapor Heating Co., Inc., Chicago, has eliminated a problem of paint peeling on various components of its steam

Photos courtesy Pangborn Corporation.

Fig. 1. Before—A table load of blower housings and large steam generators control cabinets are cleaned by Vapor Heating Co., Inc., in its 8-ft. diameter Rotoblast table room.

generators, blowers, radiators and other railroad passenger car heating equipment.

In addition, the 8-ft. diameter Rotoblast table-room installed in this plant speeds cleaning operations, simplifies handling and substantially reduces man-hours. The company conservatively estimates that this cleaning equipment is saving them at least 10 man-hours per heating unit.

For each steam generator produced, approximately 25 parts are made ready for painting in the blast cleaning unit. The cleaning operation removes weld slag, shop dirt, mill scale and rust and thus provides a better bonding surface for the paint. Typical parts cleaned include large control cabinets for steam generators, blower housings shown before and after cleaning in Figure 1 and 2, and welded

. . . *continued on page 152*

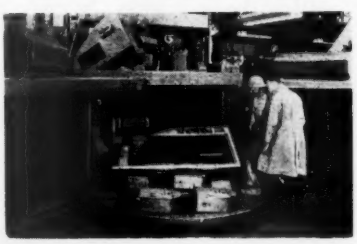


Fig. 2. After—Cleaned parts have satin smooth finish and are free of weld slag, mill scale, rust and shop dirt. Paint does not peel from these blast-cleaned parts.

UNIVERSAL DRILL BUSHINGS establish new standards of high quality

Universal Drill Bushings, produced at the big, modern plant of the Universal Engineering Company, have been first in industry for more than 25 years. They are accurately machined with superhoned bores from the finest quality steel and carefully inspected to insure maximum efficiency and extremely long life. Write today for complete information.

The modern home of finer production tools

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8, MICHIGAN 156-A

THREAD BROACHING
ENDS TAPPING TROUBLES

Ultra Precision THREAD-CUTTING BROACHES deliver these advantages:

- End tapping trouble.
- Produce threaded holes by a Shearcutting action.
- Are practically unbreakable
- Ground from hardened high-speed solid blanks.
- Require only half the power needed for tapping.
- Have an amazing long life.
- May be resharpened many times
- Feed the chips out of the hole
- Lower production costs
- Replace standard taps in most sizes

SHEARCUTTER TOOLS COST LESS IN THE LONG RUN
These ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.
Patent Warning: All Shearcutter Tools are protected by U.S. and Foreign Patents, received, pending or applied for

*ANOTHER AMAZING INVENTION OF RALPH GORDON FEAR

SHEARCUT TOOL CO.
MANUFACTURERS OF THE WORLD'S MOST SCIENTIFIC CUTTING TOOLS
7041-7045 Darby Avenue TP-43 Reseda, Calif. (L.A. County)

LEVIN ®
MICRO-DRILL PRESS
for holes as small as .002"

Designed to hold small drills in precision collets. Absence of a sliding quill guarantees extreme sensitivity with finger-tip control. A mounted ½" capacity drill chuck can also be used.

Write for Bulletin H describing the Micro-Drill Press and listing collet sizes. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, California.

THERE'S A
Morton FIXTURE CLAMP and or COMPONENT TO FIT YOUR MOST *Exacting* REQUIREMENTS

● ECONOMIZE . . . Use them as STANDARDS. Your tool stores should have a representative stock of all MORTON details.
● HIGHEST QUALITY of workmanship and materials maintained. Backed by over 30 years of fine tool making.
● IMMEDIATE DELIVERY on Standards. May be modified to suit your application.

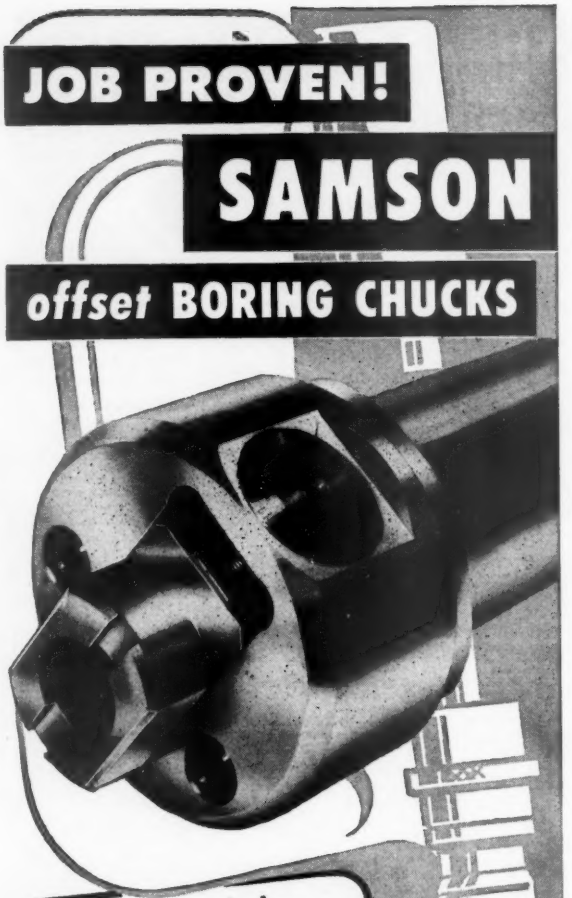
Write for: Instructive illustrated Catalog containing full size templates of each product for tracing purposes.

MORTON MACHINE WORKS
2521 WOLCOTT STREET • DETROIT 26, MICHIGAN

JOB PROVEN!

SAMSON

offset BORING CHUCKS



precision built by precision toolmakers for accuracy and durability in service!

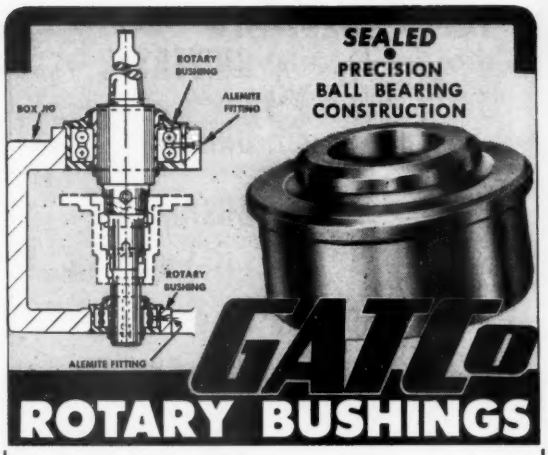
• Designed for quick tool change; equipped with new, extra large dial for precision radial adjustment; machined to provide positive dead centering for rigid, high production milling and boring without removal of chuck; available with a complete selection of interchangeable accessories—these are features that make the Samson Offset Boring Chuck the logical first-choice of the field.

Write for complete information today

ALSO Distributors of famous LAST WORD WHEEL DRESSERS

LAST WORD sales company

18500 MT. ELLIOTT AVE. • DETROIT 34, MICH.



GATCO

ROTARY BUSHINGS

FOR

DRILLING

CORE DRILLING

ROUGH

AND

FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.

42330 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.

Telephone PLYMOUTH 1472

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

—Inform-A-Gram

QUICK-PIC CATALOGS

—Fast Service Free

BAR AND TUBE PRINTER

The unit illustrated will print round, rectangular, or hexagon shaped bars or tubing as fast as the material is being fed. Easy adjustment from ½" to 6". Bulletin contains all data, photos.
Circle Inform-A-Gram No. E1.

HEAVY DUTY CONVEYOR

All specifications and data on the "Floor-Veyor" heavy duty power belt conveyor are contained in this bulletin FV-53. Mounting and engineering drawings are included, plus full features list.
Circle Inform-A-Gram No. E2.

HYDRAULIC PRESSES

This new bulletin by Clearing has all data on the company line of standard and special hydraulic presses. Full pictorial treatment is given to both features and the presses. Well ordered brochure.
Circle Inform-A-Gram No. E3.

DRILL PRESSES

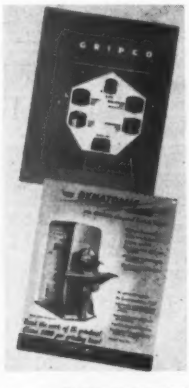
The complete South Bend drill press line is presented in this latest catalog. Clearly explains all salient features of precision, economy and multi-spindle models. Also section on attachments.
Circle Inform-A-Gram No. E4.

CINCINNATI GILBERT

Boring mills and radial drilling machines are subject of this new catalog from Cincinnati Gilbert Machine Tool Co. All specifications and data on a complete line of radials, table and floor type mills.
Circle Inform-A-Gram No. E5.

SURFACE PRECISION

New precision surface form grinder bulletin from Ex-Cell-O Corp. completely illustrates and describes features and specifications of the style 84 machine. Of great interest in jet engine program.
Circle Inform-A-Gram No. E6.



FASTENER SELECTION

Featuring the new Gripco "Clinch" nut for blind assemblies or for additional threading depth in thin metal applications, this new catalog also details a very complete line of steel or brass nuts.
Circle Inform-A-Gram No. E9.

BIG CARBIDE SAVINGS!

New grinding principle described in this catalog will save up to $100.00 per carbide grinding hour. Complete comparative performance and process figures and data. No diamond wheels used!
Circle Inform-A-Gram No. E10.

PORTABLE POWER

Portable power tools for industry are the subject of a 1953 buyer's guide from Skil Corp. Comprehensive catalog data and ordering information, price sheets, plus full and profuse illustrations.
Circle Inform-A-Gram No. E7.

HELICAL GEAR DRIVES

Installation, design and construction features of helical gear drives are the subject of this new bulletin. All factors which influence correct job selection are discussed in detail.
Circle Inform-A-Gram No. E8.

PERSUASIVE ABRASIVE

This bulletin contains a deal of worthwhile information on the application of peening shot to your finishing and abrasive problems. Also details on a shot product line with full quality control.
Circle Inform-A-Gram No. E11.

CLUTCH & BRAKE

Warco pneumatic friction clutches and brakes for press fitting are the subject of this catalog. Full information is given on performance figures, comparative figures and maintenance. Illustrated.
Circle Inform-A-Gram No. E12.

FLEXLOC LOCKNUTS

This new catalog from SPS lists the sizes and metals in which Flex-Locs are available (thin and regular). Also external wrenching and clinch nuts. Illustrates many cost saving applications.
Circle Inform-A-Gram No. E13.

SELECTED STANDARDS

Lodding fixture catalog offers a selected group of standard assemblies and details. All components necessary to standardize tool engineering practice. Full scale layouts. No deadwood.
Circle Inform-A-Gram No. E14.

DRILL UNIT INFO.

"Air-Powered Hydraulic Drill Unit" is title of this new catalog. It has extensive engineering data on Delta units plus charts as an aid to operations analysis. Fully illustrated, exceedingly valuable.
Circle Inform-A-Gram No. E15.

FULL "SPRAG" COMPLEMENT

New folder illustrates Formsprag line of over-running, indexing and backstopping clutches giving great torque capacity for size and weight. Application and engineering data are included.
Circle Inform-A-Gram No. E16.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

RIMAT DIAL BORE GAGES

FOR PRECISION MEASURMENT OF:
"O" RING GROOVES
SNAP RING GROOVES
THREAD RELIEFS
ETC.

SIZES .300" to 6.000"

THE ORIGINAL INDICATOR GAGE DESIGNED FOR MEASUREMENT OF INTERNAL GROOVE DIAMETERS

For Information Write To

RIMAT TOOL CO., 27 W. Dayton St., Pasadena 2, Calif.

STOP DUSTS INSTANTLY

with

DUSTKOP

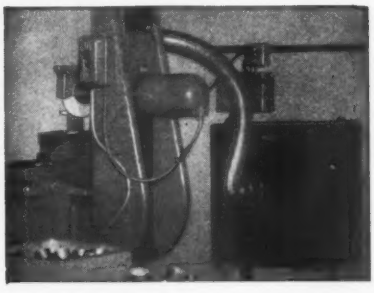
Available from stock of 22 standard models.

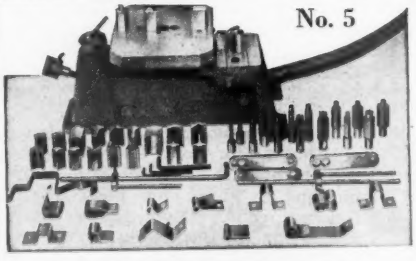
300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.

AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan





No. 5

WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x 4" air operated.

ALSO AIR OPERATED MODELS.

J. A. RICHARDS CO. KALAMAZOO, MICH.

Specify DESTACO Arbor Spacers and Shims

For milling, slitting, and gang-saw setups, shimming gears and bearings. Sets in 20 diameters ⅜" to 4" . . . 19 graduated thicknesses .001" to .125", specials over .125". Spacers with keyways, shims without. Stocked by Industrial Distributors.

DESTACO DETROIT STAMPING COMPANY

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

. . . Blast cleaning, from page 148

steel coils, Figure 3. Cleaning times are: 30 seconds for small, thin pieces; 3 minutes for the harder-to-clean parts; and 5 minutes for the very difficult heat exchanger coils. However, most of the parts are cleaned perfectly in 2 minutes.

These hot rolled and cold rolled steel parts are painted twice — once before assembly,

Fig. 3. The Rotoblast table-room also cleans effectively the multi-surfaced welded steel heating coils.

once after — with a special silicone paint. Before the units were cleaned by blasting, both coats of paint were gray. However, the quality of cleaning with the blast unit is so high—it produces a satin smooth, gray finish — that painters, at first, had a difficult time in the touch-up operation distinguishing between painted and unpainted spots. For this reason, the first coat is now tan; the second gray. With the two-color method, each unit is assured of two complete layers of protective paint.

The blast unit was installed in the cleaning department with its rotating table at floor level. As a result, loading and unloading operations are simplified. Also, the company has eliminated the extra work in cleaning and handling that resulted when parts that could not be finished satisfactorily by pickling and grinding were sent out to a commercial blast cleaner.

Fig. 4. Table at floor level makes loading easy. To left of Rotoblast table room is a completed Vapor-Clarkson steam generator which will be installed in a diesel locomotive to generate the steam for heating a streamline train.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

SEND FOR YOUR
FREE COPY
NEW ACME BUSHING CATALOG

Contains America's LARGEST BUSHING Selection

Features 2 Standards
A.S.A. Standard Plus
Acme Standard

Makes Bushing Procurement Easy... Fast! Send For Your FREE Copy Now!

Simplifies, speeds bushing selection. Packed with valuable data. Saves you time and trouble. Also includes liners, leader pins, dowel pins, locating jigs, etc.

Serving Industry For 28 Years

ACME INDUSTRIAL COMPANY
206 N. Laflin St., Chicago 7, Illinois

MANUFACTURERS OF DRILL JIG AND FIXTURE BUSHINGS

ELIMINATE HUMAN ERRORS WITH INDICATING MICROMETER & COMPARATOR

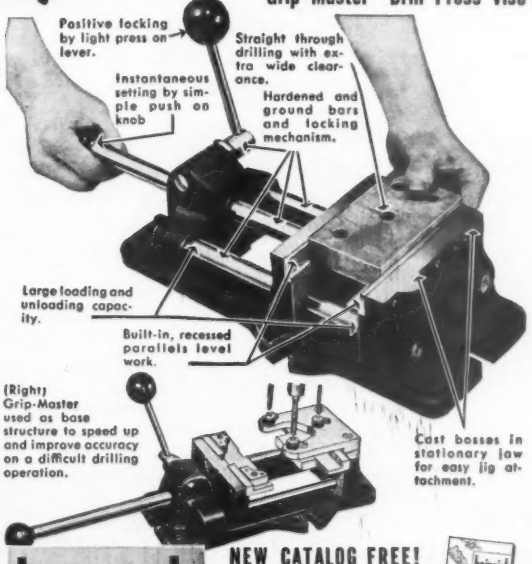
COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths-NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED.
WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

SEND FOR ILLUSTRATED CIRCULAR

GEORGE SCHERR CO., Inc.
200-T LAFAYETTE ST. • NEW YORK 12, N.Y.

Speed-up OPERATIONS with heinrich
"Grip-Master" Drill Press Vise


Positive locking by light press on lever.
Instantaneous setting by simple push on knob
Straight through drilling with extra wide clearance.
Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
Built-in, recessed parallels level work.
(Right) Grip-Master used as base structure to speed up and improve accuracy on a difficult drilling operation.
Cast bosses in stationary jaw for easy jig attachment.

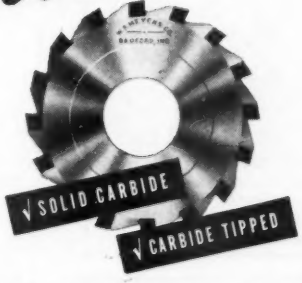
heinrich TOOLS, INC.
FORMERLY NATIONAL MACHINE TOOL CO.

NEW CATALOG FREE!
Be sure you have a complete Heinrich Tool Catalog in your files. Your copy will be sent free upon request.

DEPT. 133-D • RACINE, WIS.

Drill Press Vises • Fixture Locks • Nibblers
Punches • Rod Cutters

PRECISION CIRCULAR CUTTERS



MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Fast, Accurate Measurements
With the AMIC "Quick-Action"
Vernier Caliper

AT NEW LOW PRICES

The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer.
Scientifically engineered, painstakingly machined, packed in a sturdy leatherette case. A tool without rival
Size 6" No. 21B, Graduation 1/40", vernier reading .001
No. 22B, Graduation 1/40" and full MM, vernier reading .001 and 1/10 MM.
Write for Circular A. Dealers inquiries invited.

AMERICAN MEASURING INSTRUMENTS CORP.
AMIC BUILDING
21-25 44th Ave., Long Island City, N. Y.
TELEPHONE: EXeter 2-0002

The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Typical direct prices for 10" lengths: ½ — $1.36; ⅜ — $1.36; ¾ — $1.58; ⅞ — $1.89. Write for price list.
THE O K TOOL COMPANY, Milford 8, New Hampshire

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

. . . Maintenance, from page 146

In this way the preventive maintenance program is fully understood by the production supervisors. Frequently the condition of the equipment in a specific department is discussed to obtain the cooperation of the department head in scheduling units for overhaul.

We are pleased to note that thru the weekly maintenance meetings, greater unity exists between production and maintenance as each has come to know the other's problems.

Savings and Benefits

The construction of new plants, modernization of existing ones, and increased mechanization have cost our company millions of dollars during the past five years. To protect this considerable investment and reduce the maintenance costs, this positive preventive maintenance program was installed.

We have purchased the best machine tool equipment available, outfitted modern maintenance shops, hired and trained maintenance personnel, and developed a capable maintenance organization. However, all this would be of little value if we did not give them a good, sound preventive maintenance program.

In reviewing results thus far, we found that we actually reduced our maintenance costs and gained the following benefits:

1. Security—production equipment in good operating condition at all times.

2. Better work control thru **scheduled** maintenance operations.

3. Better work planning thru work load determination from preventive maintenance inspection reports.

4. Better spare parts control thru a determination of requirements from inspection records.

5. Reduction of mechanical downtime thru scheduled periodic preventive maintenance inspections.

6. Increased life expectancy of building and equipment.

7. Better quality control thru uniform and constant operation of properly adjusted and maintained equipment.

8. Economical use of maintenance personnel.

9. Better worker morale thru a clear definition and understanding of their maintenance duties.

10. A complete knowledge of job costs and routine maintenance expenditures.

11. Proper lubrication on a systematic basis.

12. Greater confidence in the maintenance organization to keep the plant operating on a three shift basis where necessary.

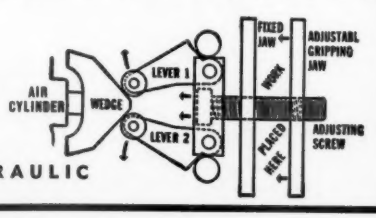
The above list does not cover all the benefits; there are many other. In behalf of Preventive Maintenance, a good slogan would be: "Prevention Thru Inspection is the Best Protection."

how about air vises!

√ MILLING
√ PLANING
√ SHAPING
√ TAPPING
√ BROACHING
√ DRILLING
√ ASSEMBLING

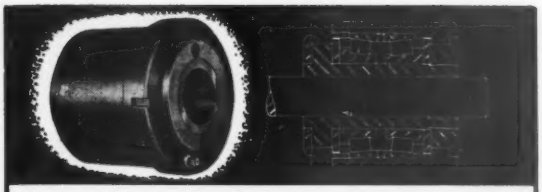
AIRLOX pat'd wedge-&-lever action utilizes total cylinder drive. Positive rigid grip on the work. Especially suited to CARBIDE MILLING, and almost all milling operations. Five senior models . . . 50 to 200 tl. air line pressure. Write for data sheet.
PRODUCTION DEVICES INC., Whitehall, N. Y.

SAFE . . . POSITIVE . . . POWERFUL



AIR AIRLOX HYDRAULIC
TM REG. U. S. PAT. OFF.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD



THE ONLY PILOT BEARING BUSHING WITH ABSOLUTE SEAL AGAINST COOLANT AND GRIT!

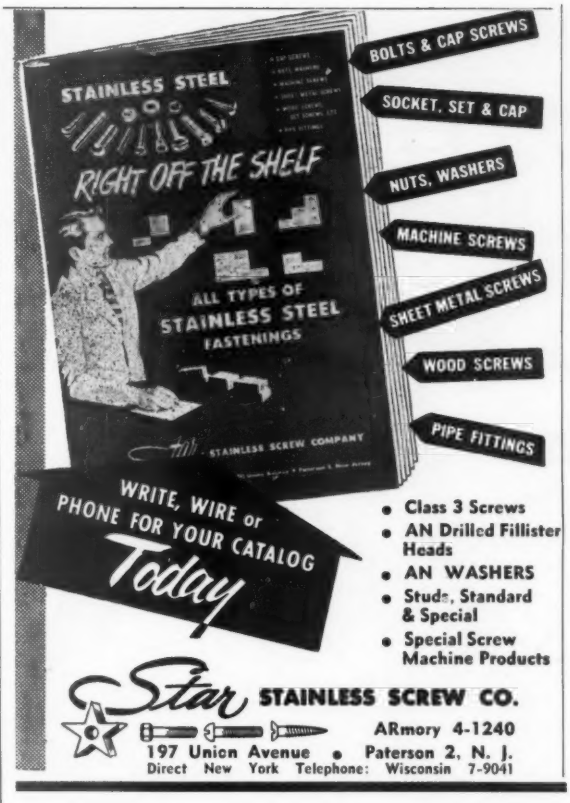
True—absolutely true—the Jergens Pilot Bushing provides complete sealing against abrasive grits and dust or other damaging materials entering into the roller bearing cavity. Amazing as it seems the entry of grit into the outer seal actually increases the effectiveness of the seal. Furthermore, this revolutionary bushing provides greater bearing accuracy—bushing stability and the first long lasting, complete seal in the roller bearing field.

PERFORMANCE FEATURES

- Absolute seal against coolants, grit and dust
- Bearings can be dissembled without removing housing
- Cartridge - type bearing holder provides greater accuracy
- Protects against thrust loads as well as radial
- Tapered bearings can be adjusted to compensate for wear
- Adaptable to receive removable slip bushings
- Adaptable to receive keys or keyways
- Can be furnished with shafts to use as pressure rolls

SEND FOR CATALOG No. TP-4

J. G. JERGENS CO.
11106 AVON AVE • CLEVELAND 5, OHIO

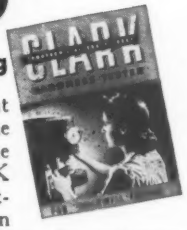


- Class 3 Screws
- AN Drilled Fillister Heads
- AN WASHERS
- Studs, Standard & Special
- Special Screw Machine Products

Star STAINLESS SCREW CO.
197 Union Avenue • Paterson 2, N. J.
ARmory 4-1240
Direct New York Telephone: Wisconsin 7-9041

GET THE FACTS

About Hardness Testing



Everything you need to know about hardness testing is told in this handsome book, prepared by the makers of the internationally respected CLARK Hardness Testers for "Rockwell Testing." Simple, easy-to-read text (in English) and numerous illustrations show the equipment and procedure for fast, accurate hardness testing of ferrous and non-ferrous materials. If you would like a copy, *free of charge*, just attach this ad to your letterhead or write "Send book." A copy will be mailed to you promptly.

P.S. If you are interested in descriptions and prices for CLARK Hardness Testers (Standard and Superficial) of *guaranteed accuracy*, say the word and we'll gladly supply them.

CLARK INSTRUMENT INC.
10208 Ford Road • Dearborn, Mich., U.S.A.

SUPEREAM

REAMERS IN DECIMAL SIZES

470 REAMERS ARE CARRIED IN STOCK VARIATIONS OF .001

▼ Sizes from .032, .033, .034, .035, .036, etc., all the way up to .501. Any size required larger than .501 . . . blanks can be ground to your exacting specifications, delivered in 3 or 4 days. By purchasing SUPEREAM Reamers in steps of .001 you SAVE time, labor and money in the cost of extra machining and lapping.

▼ SUPEREAM Reamers all have ground and polished flutes and are held within .0002 tolerance. Reamers are also furnished in Right-hand spiral, Right-hand cut, as well as Left-hand spiral, Right-hand cut. These are delivered in 3 to 4 days.

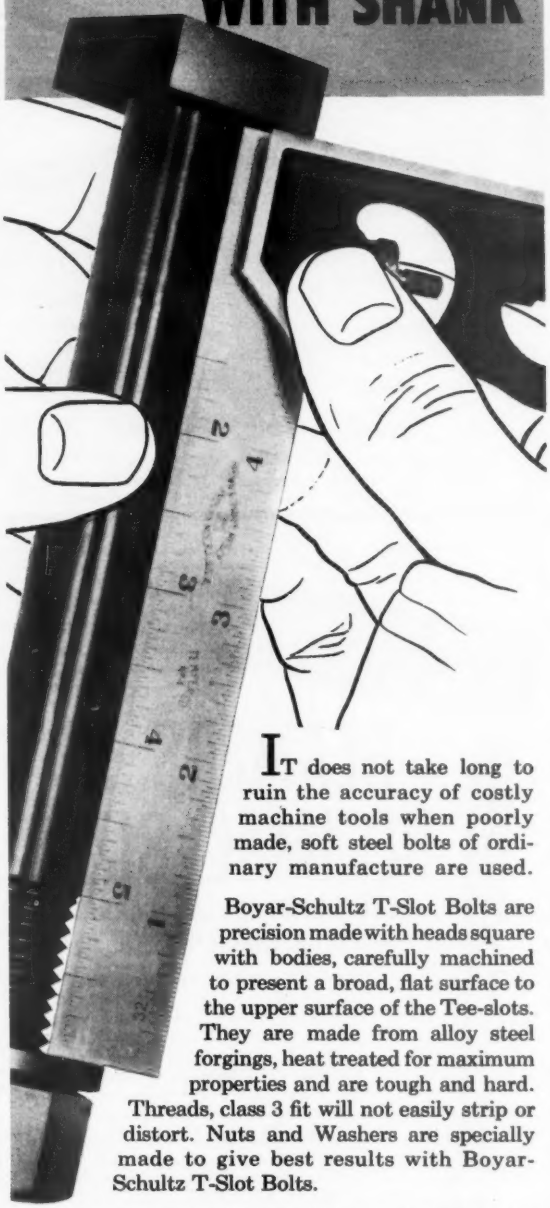
Write for descriptive literature and prices

BOX 429-TP LIBERTYVILLE, ILL.

TWENTIETH CENTURY MANUFACTURING CO.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Boyar-Schultz T-SLOT BOLTS HEADS ARE SQUARE WITH SHANK



IT does not take long to ruin the accuracy of costly machine tools when poorly made, soft steel bolts of ordinary manufacture are used.

Boyar-Schultz T-Slot Bolts are precision made with heads square with bodies, carefully machined to present a broad, flat surface to the upper surface of the Tee-slots. They are made from alloy steel forgings, heat treated for maximum properties and are tough and hard. Threads, class 3 fit will not easily strip or distort. Nuts and Washers are specially made to give best results with Boyar-Schultz T-Slot Bolts.

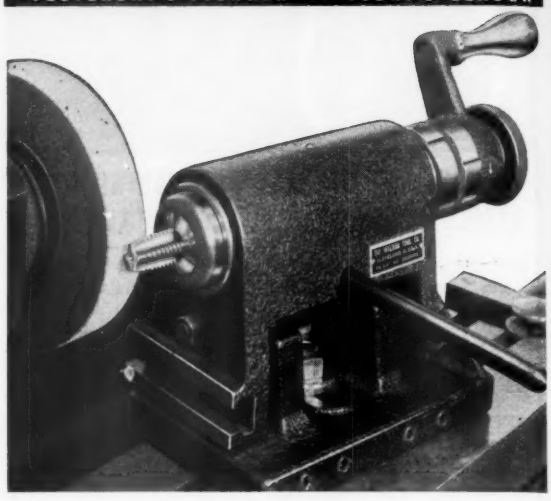
When compared with refinishing and trueing the bed of a machine tool, the cost of GOOD bolts is trifling.

Write for Free Catalog

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street Chicago 12, Illinois

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Tap Sharpening Fixture

● This is a simple, effective device which makes tap sharpening easy. It is specially designed for use with the well known Weldon End Mill Sharpening fixture.

The rocking head is actuated by a cam creating correct radial clearance at point of tap. This device serves taps from ⅛″ to 1″. Compared with conventional devices it is relatively inexpensive.

Weldon Distributors throughout U. S. A. and Canada carry complete stocks to serve you.

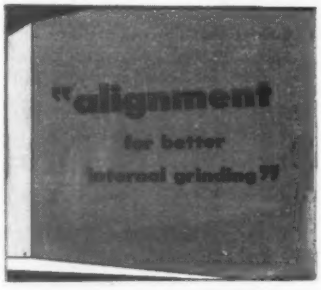
THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

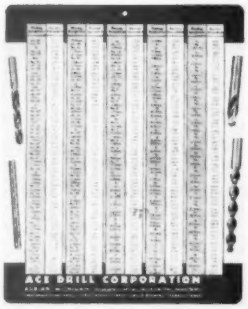
"Eliminating Rejections in Defense Welding" is the title of a pocket size booklet now available from Eutectic Welding Alloys Corp., 172nd Street & Northern Blvd., Flushing, New York, N.Y. Broadly, the booklet is divided into two subject sections. The first of these has case history style descriptions of how real problems in welding both ferrous and non-ferrous metals were solved, made fully useful by detailed step-by-step procedure and equipment data. These are divided between maintenance and production fields. The second section contains many useful charts and tables. 48 pages. **Circle Inform-A-Gram No. C1.**

"Alignment for Better Internal Grinding" is a 30 minute, sound, color, 16mm movie by the Bryant Chucking Grinder Co., Springfield, Vt. It is a semi-technical discussion for supervisory and management groups of the fundamental principles underlying the art of internal grinding, and presents basic information on the alignment of the internal grinder not previously available. **Inform-A-Gram No. C2.**



The Difference Between Success and Failure in critical metal cleaning operations is subject of the booklet "Some Good Things to Know About Metal Cleaning" from Oakite Products Inc., 157 Thames St., New York 6, N. Y. It contains sections on tanks and machine cleaning, on electrocleaning steel, brass and other non-ferrous metals, on pickling, de-oxidizing and bright dipping on pre-paint treatment, and many other subjects.
Circle Inform-A-Gram No. C3.

Wall Chart Shows Consecutive Listing of Regular Drill Sizes. Ace Drill Corporation, Adrian, Michigan, has just prepared a convenient and useful eleven inch by 14 inch wall chart for use in tool rooms and anywhere else where drills are used or specified. This chart consolidates fractional, wire, letter and millimeter sizes into one consecutive listing, in numerical order of their decimal equivalents. The chart covers the complete range of 327 drill sizes from .0135" to 1.000" diameter. It should prove equally useful to purchasing agent and engineer, and in the tool crib.
Circle Inform-A-Gram No. C4.



Stainless Steel Fastening Selector quickly and accurately converts A-N fastener numbers into common place description terms. From Anti-Corrosive Metal Products Co., Inc., P.O. Box 870, Albany, N.Y.
Circle Inform-A-Gram No. C5.

Unusual Metals Chart shows compositions of all commonly used metals and alloys. Constituent elements, percentage composition ranges, atomic number, specific gravity, etc. Sam Tour & Co., Inc., 44 Trinity Place, New York 6, N.Y.
Circle Inform-A-Gram No. C6.

"How and Why Taps are Precision Ground" is title of report now available from Edward Blake Co., Dept N-81, 437 Cherry St., West Newton 65, Mass. Comprehensive unbiased subject coverage from A to Z, charts, diagrams, etc.
Circle Inform-A-Gram No. C7.

Steel Castings Specification Chart. Reference aid to designers, purchasing department engineering staff, etc. Full coverage includes recently adopted standards. Heat treatment, compositions, properties, etc. Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15.
Circle Inform-A-Gram No. C8.

Booklet on Metal Spinning tools and practices is now available from the Boice-Crane Co., 930 W. Central Ave., Toledo, Ohio. 17 pages of condensed and valuable information.
Circle Inform-A-Gram No. C9.

Tube Working Handbook from Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill., has 31 pages of useful information, covers all aspects of modern tube fitting in practical language. Especially valuable to the apprentice, refresher for the expert.
Circle Inform-A-Gram No. C10.

Booklet "How to Prepare Perspective Drawings for Training Literature" is now available from TM Publishers, Inc., 936 N. Michigan Ave., Room 300, Chicago. Write direct for your copy.

"Compressed Air Power in Industrial Production" is title of a new pamphlet by the Compressed Air & Gas Institute, 1410 Terminal Tower, Cleveland, Ohio. Presents representative tools, methods, etc.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

New Technique for Forming Intricate Die Cavities

An advanced technique in forming very small and intricate die cavities, for certain types of zinc alloy die castings, is being successfully used by the Allen-Stevens Corporation, Jamaica, N. Y. This technique employs beryllium copper in place of tool steel for such cavities as cannot be practicably made by conventional hobbing practice.

Sample zinc castings, showing contours of the projecting lugs to be reproduced by the dies.

A close examination of the two zinc die castings illustrated, reveals that they are quite intricate in shape. These parts are small precision lock components. The projecting lugs are actually cam surfaces and, if produced by any means other than die casting, would entail prohibitively expensive machining to achieve the required contours and dimensional accuracy.

The cutting of cavities to die cast these parts, however, presented some difficulties. What kind of cutting tool, for instance, could get down in the small holes which would be required in the die cavities and shape the precise surfaces of irregular contour and square corners? This problem led to the consideration of hobbed rather than machined die cavities.

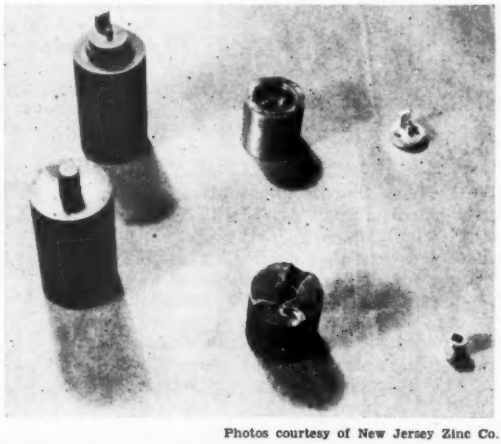
In hobbing, a hard steel male pattern—or hob, as it is called—of the part to be cast is pressed, under tremendous pressure, into softer steel to form a female die cavity. This practice is followed when it is more feasible to machine a male duplicate of a part than to cut a female impression. Hobs also are used to form duplicate cavities for high production at less cost than machining each cavity separately.

Hobbing is not practical, however, with hobs of contour such as the two lock parts illustrated, since non-symmetrical hobs frequently become distorted or break under the pressure required to press them into steel. It was at this point that beryllium die cavities were considered.

The usual hard steel hobs were made of the two lock part shapes; but, instead of pressing the hobs into steel, molten beryllium copper was poured around them, with pressure then being applied to form the cavities. Depending upon the shape of the cavity, a round or rectangular chase is used to contain the molten beryllium copper. The hob is screwed into place at the bottom of this container and heated, after which the molten beryllium copper is poured around it. By using a hobbing press, a piston which fits the chase rather closely is forced down to compress the metal. The metal is allowed to cool while the piston is still in the down position. The final step is to back off the press and disassemble the setup to remove the cavity casting.

Since much less pressure is required in this method of hobbing, there was no tendency for the cam-shaped legs on the hobs to shear off or break, and the beryllium copper cavities were formed with no difficulty.

. . . *Continued on page 163*



Photos courtesy of New Jersey Zinc Co.

Left to right are the hob, the beryllium copper die cavity and the finished casting in each instance.

DEALERS Write for Our PROPOSAL

The BARKER "MILLER"

PRECISION - PRODUCTION - ECONOMY

PRODUCTION MODEL

Exclusive 3-Way Travel

Pre-loaded, double row ball bearing spindle. Various spindle speeds available with different pulley combinations.

at a rapid rate by inexperienced operators. Easy set-up for small run jobs.

Second to none.

Priced Under $350.00

Complete as Shown, Ready to Operate.

MASSIVE, HEAVY HEAD and table to allow fast cuts without chatter.

You can easily effect a 50% economy in the milling costs of small parts with this versatile machine.

Designed and built for holding close tolerances on big run jobs. Hundreds in use in large plants from coast to coast.

The "BUY"-WORD for small parts milling jobs is "BARKER MILLER."

WRITE FOR LITERATURE AND COMPLETE INFORMATION

BARKER ENGINEERING COMPANY 500 GREEN ROAD CLEVELAND 21, OHIO

Send For This!

Information on latest precision micrometers, gages, dial indicators, calipers, rules, Verniers, etc. Production, inspection and personal tools as used in finest aviation, automotive, armed services production. New ideas. New methods. Time savers. Big new illustrated catalog. Reserve copy now!

TUBULAR MICROMETER COMPANY
Box 30, St. James, Minnesota

● Please send new Tumico catalog as described . . .

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

*Firm Name*_____ *Position*_____

MAIL COUPON TODAY

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

De-Sta-Co Toggle Clamps are extremely flexible in their application and are economically and easily adapted to work-holding fixtures for assembly, welding, bonding, machining or other production processes. Smooth, fast, powerful clamping action clamps parts quickly . . . holds them firmly in perfect alignment . . . releases instantly for easy removal and insertion of new workpiece.

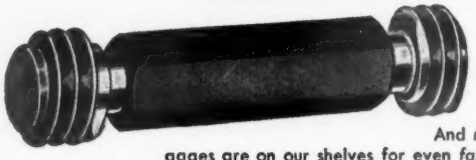
De-Sta-Co clamps are engineered for rugged use in production; reamed bearing holes insure precision fit, long life and sensitive operation . . . offsets in handles and links relieve friction . . . made with cold drawn bars, and forged portable clamp parts. Accessories for adapting clamps to specific applications are available.

Write today for name of nearest distributor and your copy of the De-Sta-Co catalog which describes over 40 fixture and portable models with positive holding pressures up to 4000 pounds.

DESTACO **DETROIT STAMPING COMPANY**

000 MIDLAND AVE. • DETROIT 3, MICH.

48-HOUR DELIVERY . . .



ON STANDARD MALE THREAD GAGES

And *most* standard thread plug gages are on our shelves for even *faster* shipment. This includes all sizes, from 0-80 NF to 1½"-6 NC, class 2 and 3, in stock.

How can Perfex maintain quantity stocks of all these popular sizes? It's simple: we've expanded our plant and facilities, added more and more fine thread grinding and checking equipment and increased our force of skilled gage-makers in order to assure you of complete service. Now we're ready to prove the quality of our work and prove it to you today, not in six weeks!

Remember Perfex for your gage needs—thread plugs, thread rings, specials from the smallest up to giants. Perfex is represented in all principal industrial areas; please write for copy of new catalog and name of the Perfex man nearest you. He's as close to you as your telephone.

Perfex also manufactures the "Tangi-Matic" angle-tangent-to-radius wheel dresser.

ACCURACY OUR CREED PERFEX **PERFEX GAGE & TOOL CO.**

120 Avery Street • Mt. Clemens, Michigan

Spray-On Dye Penetrant

A more reliable dye penetrant has been developed for locating cracks in any solid material. A packaged kit, which contains dye, cleaner and developer, is easily carried for inspection of small questionable areas and remotely located parts.

Photos courtesy Magnaflux Corporation

Maintenance inspection of suspicious area on punchpress frame. Spotcheck penetrant is sprayed on.

Features include pressure spray cans of dye and cleaner for conveniently rapid spray application to any part.

For plant maintenance of mechanical equipment or for tool inspection in any industry, for weld, casting, or forging inspection, or for overhaul tests of any transportation equipment, the Spotcheck kit is carried to the parts in question, and tests for cracks carried out in but a few minutes. No power or special lights are required.

The Dye Penetrant is pressure-can sprayed on the clean surface to be tested. Spraying is easy and non-critical, like spraying an insect spray from

. . . *continued on page 164*

A bright red line shows beginning of crack.

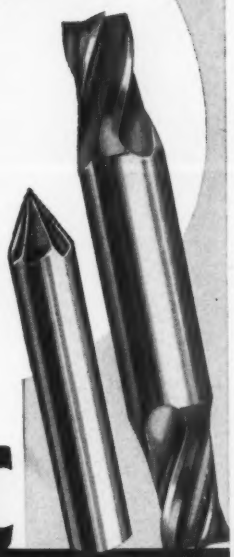
GET LONGER LIFE
with exclusive Colonial #3 steel drill jig bushings
Ask for handy "Flip-a-page" Catalog (B-649) and prices
COLONIAL BUSHINGS, Inc.
31780 Groesbeck Highway • Fraser, Michigan

COLONIAL
DRILL JIG BUSHINGS

RAYMAC
SOLID CARBIDE
END MILLS
AND
CENTERLAPS

Raymac Solid Carbide end mills and centerlaps assure you precision workmanship, long tool life and minimum down time, plus the advantages of a specific tool for individual applications.

Write today for complete technical information.



RAYMAC
MANUFACTURING COMPANY INC.
3729 CASS AVENUE, DETROIT 1, MICH.

FAMOUS ERA BEAM COMPASS

A HIGH GRADE INSTRUMENT

Used by Leading Draftsmen and Designers for INKING and PENCIL DRAFTING

A fine precision tool. Hair-line adjustment quickly made and maintained by spring-loaded knurled thumb rollers. No screws or clamps. Lead expeller for easy control of lead length. Slides instantly interchangeabue to any beam length. Made of anodized aluminum, stainless satin finish. Beam lengths from 7" to 100".

Combination Square

TRAMMEL HEADS

Make
Accurate Compass, Height Gage
Outside and Inside Calipers

Heads chrome plated, screw parts protected by cadmium plating, scriber points made of hardened tool steel. Perfect for work on wood, plastic, sheet metal, linoleum, die or tool layout. Hundreds of uses. Comes complete with plated head, scriber points, pencil tips, special caliper points.

WRITE FOR LITERATURE

ENGINEERING RESEARCH ASSOCIATES, INC.
3475 East Nine Mile Road Hazel Park, Michigan

REDUCE COSTS ON "SMALL-WORK" GRINDING & FINISHING JOBS with

Foredom FLEXIBLE SHAFT MACHINES

YOU GET ALL these features superior

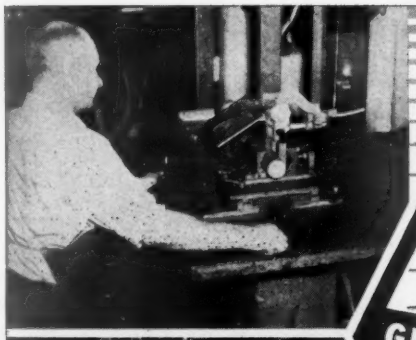
- Feather-weight, finger-tip-controlled handpiece (pencil size or larger) which eliminates operator fatigue.
- Choice of 5 handpiece types (all instantly interchangeable). You fit the handpiece to the job at hand.
- Extra good flexing qualities in the flexible shaft assembly for effortless maneuverability.
- Longer motor life because motor is not dwarfed to fit the hand.
- High speed which does not drop precipitately under load.
- Silencer-equipped flexible shaft for vibration-free performance.

BENCH OR HANG UP MODELS FOR HEAVY OR LIGHT DUTY

Also flexible shaft tools attachable to your own drill press or motor. Use Foredoms to GRIND, POLISH, DRILL, ROUT, CARVE, MILL, SAW, SLOT, CLEAN, SAND, ETCH, ENGRAVE, etc., etc.

Write for Catalog 1760

FOREDOM ELECTRIC CO. Dept. 1760, 27 Park Place, New York 7, N. Y.



FRICTION SAWING WITH Tannewitz HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Tremendous savings of time and money are effected in trimming formed parts with Tannewitz High Speed Band Saws, for not only are the cuts made exceedingly fast, and smoothly, but in most cases no jigs or rests of any kind are required. Sheets of both hard and soft steel, and even such metals as 1" armorplate are handled with great advantage by this method, and it is ideal for trimming malleable and steel castings. By all means get the complete facts and learn of the many opportunities for boosting production and lowering costs that Friction Sawing with Tannewitz High Speed Band Saws offers. Write for circular.

for trimming castings of all metals write for bulletin on "Foundry Band Saws".

SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

FOSTER *PRECISION* HEIGHT GAGES 8" to 48"

Delivery from stock

- EXTREMELY ACCURATE
- WELL BALANCED
- HEAVY BASE AND BEAM
- GREATER STABILITY
- CLEAR-CUT 1/1000" GRADUATIONS
- HARDENED CHROME OR STAINLESS STEEL
- IN BEAUTIFUL WOODEN CASE

also FOSTER 6" to 48" *Precision Vernier* CALIPERS

WRITE

FOSTER SUPPLIES CO.

5252 N. BROADWAY CHICAGO 40, ILL.

When so much depends on so little

Don't settle for less than Chicago "*Safety Plus*" High Carbon Heat Treated Cap Screws

- For *complete* hardness from the center all the way out—no soft skin to cause wear or breakage due to fatigue.
- For freedom from scale — cleaner to handle — give a tighter thread fit — have smoother bodies.
- For extra safety — better appearance — ALL at no increase in cost to you.

When you use Chicago "Safety Plus" Heat Treated Cap Screws, this is what you get:

Extra Hardness here keeps corners sharp, prevents wrench slipping on head.

Extra Hardness here gives more wearing surface on body.

Extra Hardness here reduces nicks, gives tighter fit, less wear on threads.

Your Service-Conscious Industrial Supply Distributor carries a complete stock of our products. Ask him for samples of Chicago "Safety Plus" Heat Treated Cap Screws. His familiarity with your local field conditions enables him to fill your supply needs promptly and correctly. Ask for "Chicago" and get "Safety Plus".

the Chicago SCREW COMPANY 2519 W. WASHINGTON BLVD. • BELLWOOD, ILL.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

. . . Die Cavities, from page 158

According to Albert M. Sanders of the Allen-Stevens Corp., the greatest advantage in the use of beryllium copper appears to be this lesser force required in the process of forming a cavity. This means that there is less chance of damaging the hob, and that delicate, symmetrical, and built-up hobs, which were previously impractical, can now be used. In addition, the cavity follows the hob much more faithfully, so that the problem of cavity walls moving away from the hob is eliminated. Further, there is no longer any difficulty in making the cavity metal flow upward, as for a convex shape.

Another advantage is that there is less metal to remove from the outside of the cavity, because it is cast closer to the desired shape. Also, the cavity can be heat treated so as to be hard all the way through. This compares favorably with merely case hardening the cavity, which was often all that could be done because of complex cavities that require soft hobbing iron rather than a hardenable tool steel.

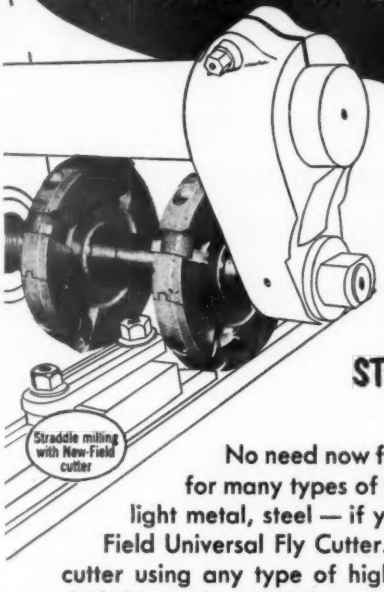
The disadvantages are that heat treatment, though simple, is unfamiliar to many heat treaters; machining of the copper cavity to fit the mold is more difficult; and, finally, unlike hobbing, which can be done by many diemakers, experienced casters of beryllium copper cavities are relatively few.

No real difficulty has been encountered with soldering, heat checking, or any other metallurgical condition. Mechanical damage, due to a foreign body in the die on closing, has been experienced here just as with other types of die cavities.

Production data on zinc alloy parts cast in these dies is not yet of sufficient extent to closely define the potentialities or limitations of the technique. As reported in the New Jersey Zinc Company's **Alloy Pot**, properly hardened cavities of beryllium copper have shown, in one instance at least, no more wear after 400,000 castings than did steel cavities. This was under conditions wherein the stream of incoming zinc alloy was not of high velocity, nor did it impinge sharply on any part of the cavity. When this requirement was not met, however, extremely rapid erosion of the cavity did take place. Proper gating, therefore, is the key to success. It would appear, from the success experienced so far, that beryllium copper die cavities may well extend the use of zinc die castings to significant new areas.

New-Field

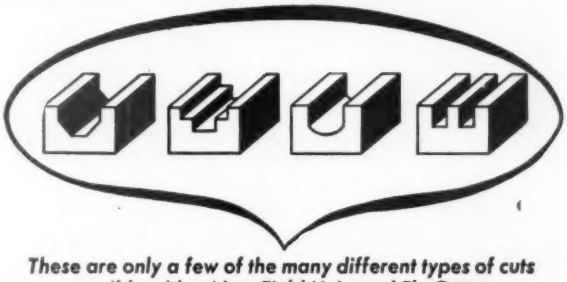
UNIVERSAL FLY CUTTER



MAKES 4-6 CUTS IN ONE OPERATION!

USES STANDARD BITS!

No need now for special cutters for many types of milling—plastics, light metal, steel — if you use the New-Field Universal Fly Cutter. One New-Field cutter using any type of high speed steel or carbide bits makes multiple cuts in one operation. Standard bits are easily reground or replaced when needed for other work. Down time is cut to minimum.

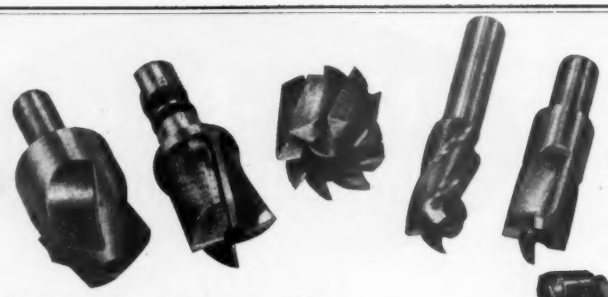


These are only a few of the many different types of cuts possible with a New-Field Universal Fly Cutter.

New-Field Cutters fit all standard arbors on horizontal or vertical mills or drill presses, turn to any required speed, have adjustable bits to permit slots of any shape from 3/16" to 2" for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting. Available in 4", 6", 8" and 10" sizes, also 6" and 8" heavy duty size designed especially for Shell End Mill Arbors. Write today for details on this versatile, money-saving tool!

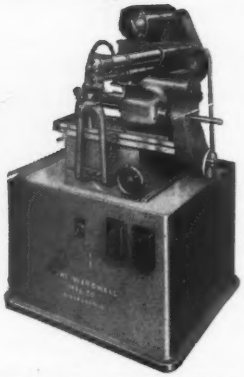
NEW-FIELD MACHINED PARTS CO.

210 W. 7th St., Los Angeles 14, Calif.
Export office: States Trading Co., 401 Broadway, N. Y. 15
Cable: STRADESO, New York



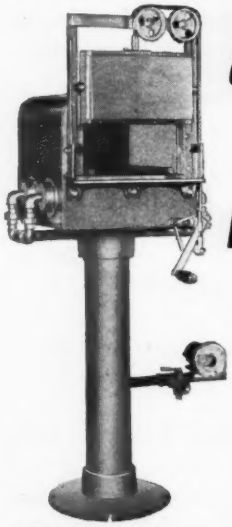
Work done by this automatic flutemiller

- Mills straight and spiral flutes
- Mills automatically, no attention required
- No special skill
- Low in cost



WARDWELL
Maker of largest line of saw and tool sharpening machines

For details write for bulletin on 90FM Hydraulic Flutemiller—Grinder also available.
THE WARDWELL MFG. CO.
3155 Fulton Road
Cleveland 9, Ohio



Quick Acting
JOHNSON
No. 130A
Hi-Speed Furnace

SAVE HOURS
CUT
HEAT TREATING COSTS

Save time, save gas . . . heat treat carbon and high speed steels, dies and tools with JOHNSON 130A. Powerful burners provide fast, uniform heat. Gets the job done while other furnaces are still warming up. Temperatures easily regulated. Firebox 7" x 13" x 16½" lined with high temperature refractory. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

For temperature range 1400° to 2350° F.—$295.00
For temperature range 1800° to 2400° F.—$325.00
F.O.B. Factory
Models available in smaller firebox sizes. Write for Free Catalog.

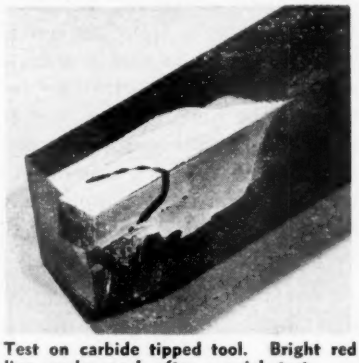
JOHNSON GAS APPLIANCE CO.
575 E Ave. N.W., Cedar Rapids, Iowa

JOHNSON
Since 1901
FURNACES FOR INDUSTRY

. . . Dye Penetrant, from page 160

a pressure can. Then a cleaner is sprayed on the surface, and removed by a quick wipe. An even coat of white developer is brushed on, and inspection follows in a few seconds. Cracks show up as bright red lines, and pores or leaks in tanks show as bright red spots.

As the Spotcheck name implies, this inspection is best and cheapest when applied to local areas of large parts, or in remote locations where only a few parts are to be tested. The test is readily used wherever a few parts are infrequently tested, as in a tool room or tool



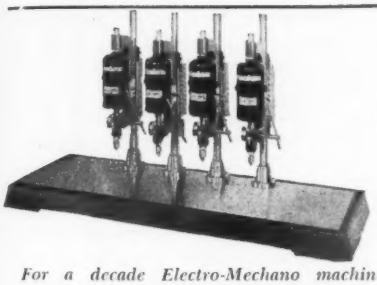
Test on carbide tipped tool. Bright red line marks crack after a quick test.

crib. This non-toxic dye penetrant test improvement has been developed from the manufacturer's many years of experience in Non-Destructive Testing, and from their years of experience with penetrants that are fluorescent, which are used for volume inspection in all metal-working industries. As reliance upon non-destructive testing increases to free industries from the costs and waste of cracked parts, the new dye penetrant inspection expands these benefits and lowers the initial purchase cost for greater benefits to more companies.

Industry News

The American Standards Association, Inc., approved 87 standards in 1952, which brought the total American Standards in effect to 1264.

Newly-approved standards of particular interest to the machine tool industry included: Accuracy of Engine and Tool Room Lathes; Acme Screw Threads; Stub Acme Screw Threads; and Mounting Dimensions of Lubricating and Coolant Pumps for Machine Tools.



EFFORTLESS ACCURATE SMALL HOLE DRILLING

For a decade Electro-Mechano machines have been used successfully by leading manufacturers. Proven design for small hole precision work includes:

- Super accurate chucking with choice of three types giving runout of .001", .0005 or adjustable to absolute concentricity.
- Minimum side play through use of smaller precision spindle bearings and widely spaced quill bushings.
- The exact speed for best drilling with continuously variable speed control: 150 to 4000 RPM, 1,000 to 10,000 RPM or 2500 to 15,000 RPM.
- Minimum vibration—high speed units have direct motor drive, no belts.
- Special slow quill feed on dual feed models for drilling below #60. Air feed models with hydraulic control for high production small hole drilling.

Replace your old drilling equipment with top efficiency Electro-Mechano Precision Drilling Machines. Your drilling problems and inquiries are welcomed.

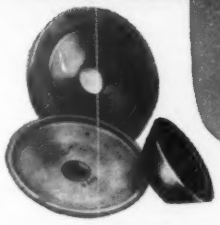
Write for literature:

THE ELECTRO-MECHANO CO.
260 EAST ERIE STREET
MILWAUKEE 2, WISCONSIN

For easier grinding and mirror finishes in a fraction of the time

LOOK TO THE EXPANDED *Star Dust* LINE!

NOW . . . A COMPLETE RANGE OF STAR DUST DIAMOND ABRASIVES FOR EVERY PURPOSE



STAR DUST DIAMOND WHEELS AND HONES

STAR DUST Laboratory graded Pure Diamond Powders

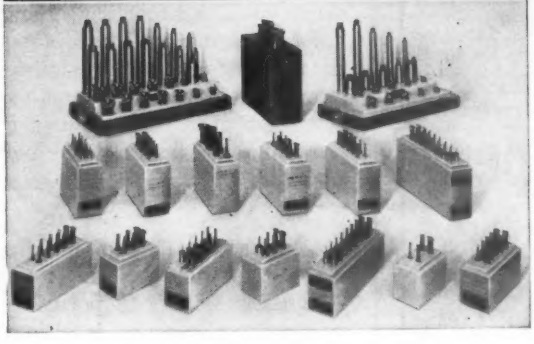
Absolute uniformity resulting from laboratory grading is the reason for the success of STAR DUST Diamond Powders and Compounds . . . And the new line of STAR DUST Diamond Wheels and Hones finds immediate acceptance because for the first time this superior diamond quality is combined with a new bonding formula. That means unequalled performance and wheel life.

Be "Laps Ahead" with STAR DUST! Most sizes available for fast delivery. Write for complete information and new comprehensive catalog C-9

STAR DUST Laboratory graded diamond lapping compounds in 18 gram applicator gun . . . or 5 gram ophthalmic tipped tube.

ACE ABRASIVE LABORATORIES
250 WEST 57TH STREET • NEW YORK 19, N. Y.

These Tool Sets . . . as important as your jig borer itself



One of the handiest and most efficient things you could own. From 16 sets — each containing 4 to 16 tools — you can choose the one that embraces just the tool assortment that will best meet your particular requirements—in any required sizes from 1/16" dia. to 1 1/2", and larger. Choice of several overall lengths. In H.S. steel (Cat. Sup. 1 to 1139-6), carbide-tipped (Cat. Sup. 1 to 398-6), and solid carbide for extreme deep hole boring (Cat. 948).

BOKUM TOOL CO.
SINGLE-POINT BORING TOOLS · INTERNAL THREADING, BOTTOMING AND FACING TOOLS — CARBIDE TIPPED TOOLS
DEPT. E • 14775 WILDEMERE AVE. • DETROIT 21, MICH.

HOW TO install the statistical method of quality control . . .

to reduce costs and improve product quality

The statistical method of quality control will enable you to secure the best possible quality assurance from a given inspection cost. This book explains fully the use of this production-line technique in reducing the cost of spoilage and rework.

Just Out!

STATISTICAL QUALITY CONTROL — 2nd Ed.

- **Simple language is used**
- **Explicit "how-to-do-it" directions**
- **46 actual case-histories**
- **no special knowledge of statistics or mathematics required**

With this industrial tool you can secure top-notch coordination of design, production, personnel, and inspection. This book shows you how to set up an expert system of quality control in your plant with immediate, practical results. Its presentation is geared to manufacturing men who have no previous knowledge of statistics or the mathematics of probability. It is for the engineer in industry, the production and inspection executives, and management men. Concentrating on techniques which have proved to be the most broadly useful and most readily understood and applied, the book demonstrates the value of the control chart in dealing with quality problems in mass production. The book shows how statistical quality control can be applied to any number of departments simultaneously, and indicates through the illustrated examples, something of the wide variety of industries in which it may be applied. **By Eugene L. Grant, Professor of Economics of Engineering, Stanford University, Second Edition, 537 pp., 94 illus., 19 tables, $6.50.**

HUEBNER PUBLICATIONS, Inc., 1975 Lee Road, Cleveland 18, Ohio

Gentlemen: Please send me at once:
☐ **copies of Statistical Quality Control by Grant @$6.50* per copy**

Name.....
Company.....
Street.....
City.....Zone.....State.....

☐ Ship postpaid. Remittance enclosed
☐ Purchase order enclosed.
☐ C.O.D. I will pay C.O.D. charges.
*Ohio Customers Add 3% Sales Tax.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Men who had to "lick" the very problems you're facing designed... ROUSSELLE PRESSES

That's why they're fast, accurate, so adaptable, so easy to operate. Why maintenance is simple. Why initial cost is low . . . Often considerable savings and improved punch press operations are possible if you let our engineering staff assist you. There is no obligation. Simply furnish the details relating to your need or problem and if possible send samples or drawings of the work. You will hear from us promptly.

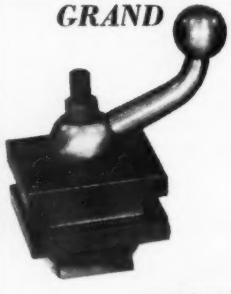
Sold Exclusively Through Leading Machinery Dealers

Rousselle Presses are Manufactured by

SERVICE MACHINE CO.

7627-31 So. Ashland Ave., Chicago 20, Illinois

GRAND



Tool Post Turret

Available from stock in 2 popular sizes

2½" to fit these lathes:
9" Atlas
9" South Bend
10" Logan
10" South Bend
2½" model $23.50

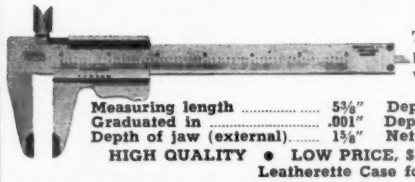
3½" With machinable base universally adaptable for lathes with 10" to 16" swing.
3½" model $34.50

F.O.B. N.Y. Prices subject to change without notice

GRAND TOOL & SUPPLY CO.

170 Grand St. New York 13, N. Y.

Precision Vernier Calipers



The TUNA Precision Vernier Calipers are made of best Swedish steel with hardened measuring surfaces.

Measuring length	5⅜"	Depth of jaw (internal)	⅝"
Graduated in	.001"	Depth of measurement from	0 to 5⅜"
Depth of jaw (external)	1⅝"	Net weight	5 ounces

HIGH QUALITY • LOW PRICE, $11.75 • IMMEDIATE DELIVERY

Leatherette Case for Calipers, $1.00

SWEDISH GAGE CO. OF AMERICA

C. E. JOHANSSON GAGE CO.—A DIVISION

10641 Haggerty Ave. • Dearborn 1, Michigan

. . . Machining Aluminum, from page 66

center of the cutter head were two additional blades; one for forming the 30 degree angle, and the other for facing the edge of the bore. The workpiece is clamped by hydraulic means in a fixture fastened in the hex. turret and hand fed into the cutter head at 846 revolutions per minute with the depth of cut ranging from 1/32 to 3/32 inches. This method resulted in the machining of one piece per pass.

References

1. "Machining Alcoa Aluminum and its Alloys", The Aluminum Company of America, Pittsburgh, Pa., 1948 ed.

2. "Machining the Aluminum Alloys", 1949 ed., Reynolds Metals Co., Louisville, Ky.

3. "Alcoa Aluminum in Automatic Screw Machines", 1946 ed., Aluminum Co. of America, Pittsburgh, Pa.

4. Kennametal Report No. 309, June 16, 1950, Kennametal Inc., Latrobe, Pa.

5. "Kennametal Cemented Carbide Products", Catalog 52, Kennametal Inc., Latrobe, Pa.

6. "Firthite Sintered Carbide Cutting Tools—How to Design, Make, Use and Maintain Them", 1952 ed., Firth Sterling Steel and Carbides Corp., Pittsburgh 30, Pa.

. . . Month's Talk, from page 72

"60 day wonders" into toolmakers.

Look at the job shops which serve you. A superficial glance shows differences in equipment, buildings and personalities. However, a thorough analysis reveals that each shop has an individual character of its own —and all ask the privilege of serving you.

Job shop methods of building die casting dies are not secret —there is no hocus pocus. It is simply a case of intelligent study, ingenuity and good honest sweat, backed up by ambition to serve you further in building better dies, faster and at lower cost.

You Need an Extra Hand Now to Speed Up Production!

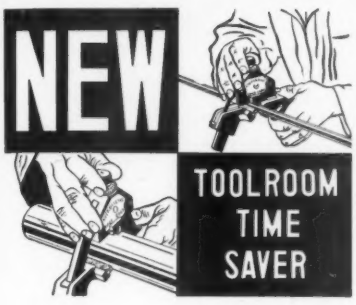
HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG. CO. • URBANA, OHIO

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD



NEW TOOLROOM TIME SAVER

SIMPLE TO SET UP AND OPERATE
★
LIGHT WEIGHT
★
VERSATILE
★
ACCURATE
★
INEXPENSIVE

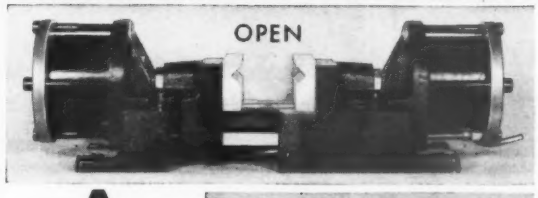
Odee-Hone *A Tool for Honing External Surfaces*

One tool for any cylindrical surface from ½" to 2½" in diameter—any length • Removes Stock • Holds accurate size • Generates—round, straight surfaces • Develops any degree of surface finish—without chatter.

USE WITH ANY LATHE, DRILL PRESS OR ELECTRIC DRILL

Manufactured by
MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT, DETROIT 4, MICHIGAN
Guilford, Conn. • Rockford, Ill. • Los Angeles 21, Calif. • Brantford, Ontario, Can.

BLACK "CENTR-FINDER" VISE



A *Precision* TOOL

designed to locate centers or other pre-determined points regardless of shape or varying sizes of parts within .001" horizontally or vertically.

Vise jaws travel on guides—actuated by opposed double-acting cylinders—synchronized by mechanical means. Force exerted is all straight line. Clamping pressures up to 2000 pounds. No pressure exerted through synchronizing mechanism. Working range 0 to 4". For centering, drilling, chamfering, hollow milling, deburring, reaming and many other production operations.

write FOR BULLETIN
BLACK DRILL CO., INC. • 1368 E. 222nd St. • Cleveland 17, Ohio

#2 HERCULES
plain, universal and vertical **millers**

for tool room & production work

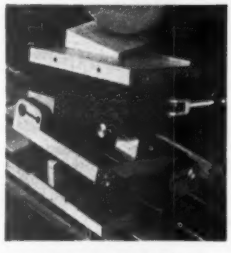
work table 12" x 51"

immediate delivery

The #2 HERCULES Milling Machines have hardened and ground gears, power rapid traverse in all directions, 12 spindle speeds and feeds.
write or phone for full details

Parker Machine Company, Inc.
158 Pioneer St., Brooklyn 31, N. Y.
TRiangle 5-2103 and 2157

ANGULAR SET-UPS
to gauge-block accuracy
IN A FEW MOMENTS



the Magna-Sine

Any angular set-up, single or compound, takes only the time to look up the angle in the Robbins Table of Constants and to insert the indicated gauge blocks between the Magna-Sine plates. It's fast—it's positive, to gauge-block accuracy. Work is held by magnetic attraction. In two models and two sizes; also in non-magnetic models for inspection work.

SEND FOR FREE CATALOG TODAY

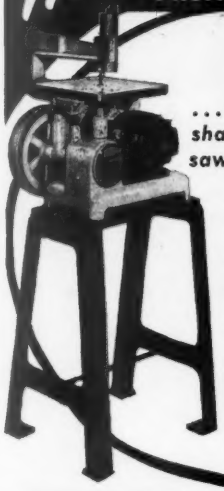
OMER E. *Robbins* COMPANY
Manufacturers of the MAGNA-SINE and Other Precision Tools
5722 TWELFTH ST. • DETROIT 8, MICH.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

CUT TOOL AND DIE-MAKING COSTS WITH . . .

Milwaukee

DIE FILERS
PROFILE GRINDERS



DIE FILERS

. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

Write for illustrated Bulletins and Prices.

PROFILE GRINDERS

. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R. P. M. spindle speeds, ½ H. P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser. Write for illustrated Bulletins and Prices.

RICE PUMP & MACHINE COMPANY
228 N. 12th Ave. • Grafton, Wisconsin

"RFC" ROLL-FEEDS

Precision Feeds For All Presses

- Easily installed on any press
- Can't slip. Reverse instantly
- Feed in thousandths
- Maintain original setting. No ratchets or pawls to wear down and affect feed spacing.

Write for descriptive literature TODAY.

ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

PRECISION INSTRUMENTS

. . . for better gaging

Made in Europe to American Standards

- **VERNIER CALIPERS** Spring or screwlock models .001 inch and 0.1 mm. verniers Also larger sizes.
- **MICROMETERS** .0001" reading—0.1". Satin Chrome Finish
- **VERNIER HEIGHT GAGES** Sizes 10", 12", 18", 20", 24", 30", 40", 60", 80".
- **VERNIER DEPTH GAGES** 6" and 12" sizes
- **DIAL INDICATORS** Various sizes
- **INTERNAL BORE GAGES** For Bores from ¼" to 15".

All instruments absolutely guaranteed.

For Descriptive Literature Write To:

KARL A. NEISE
381 4th Ave., Dept. TP, New York 16, N. Y.

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C 1A, 4C 5C

480 (AC-50)

All collets in hexagon, square and round.

KLUTCH-KOLLET Step collet for accurate chucking to 2⅝" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

HAND DRAWBAR ½" cap.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

LIVE CENTER (Ball Bearing) Double sealed for accuracy.

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

GENERAL DIE AND STAMPING CO.
Integrity Since 1919
264 MOTT STREET • NEW YORK 12, N. Y.

SEND FOR FREE CATALOG TODAY

T-NUT & STUD SETS
STEP BLOCK SETS
PUNCH PRESS SETS

QUARTER TURN SCREWS
SHOULDER SCREWS
DOUBLE END JIG FEET
SCREW TYPE JIG FEET
PRESS TYPE JIG FEET
FLANGED NUTS
CUT THREAD STUDS
TEE-NUTS
COUPLING NUTS
ADJUSTABLE STEP BLOCKS
STAR TYPE HAND KNOBS
HEXAGON TYPE HAND KNOBS
KNURLED HEAD SCREWS

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

DON'T SCRAP IT!

Ever have a tap or drill break in an expensive part? . . . so that even careful drilling couldn't save it? Today, parts costing as little as 50c can be economically salvaged by an Elox Electron Drill.* They're real money savers! No plant can afford to be without one. Write for particulars.

ELOX CORPORATION
OF MICHIGAN
734 N. Rochester Rd.
Clawson, Michigan
*T.M. Reg.

EXTRA HARD — EXTRA TOUGH

for Millers Duplicators Die Sinkers Pantographs

BLACK STRAND Cutters-Blanks

Write for Literature and Prices
EDWARD D. STRAND COMPANY
Box 54, West Side Sta., Worcester, Mass.

EISLER JIG BORING

CAM MILLING

A SPECIALIZED CAM MILLING SERVICE . . . JIG BORING . . . SPOT WELDING . . . CONTRACT PRODUCTION . . . EXPERIMENTAL DEVELOPMENT

JOB WELDING

EISLER ENGINEERING CO., Inc.
732 So. 13th St. Newark 3, N. J.

At Last!—A Low-Priced Dial Indicator

CHECK THESE IMPROVEMENTS:

Twin telescoped contacts. Contact can be instantly changed. 1/32" is threaded within larger 1/8" contact. No screws to bother with. Double faced. Simultaneous reading front and back. Two non-breakable crystals. Being enclosed, chips and dirt cannot get in to make pointer stick.

Double faced dial indicator complete with cadmium plated holder including 1/32" and 1/8" contacts.

Black Pentrate $6.95
Satin Chrome $7.95
1/32" contact, 1/2" long extension ..... $ .75

SUPERIOR INDICATOR COMPANY
P. O. Box 734 ROCHESTER 3, N. Y.

. . . Foreman Training, from page 113

the "straw-boss" classification and making them businessmen at the production level. Let's show them their functions, give them back their authority and responsibility, and train them to use the management tools necessary to run their departments like a business; each department a business that earns a measurable profit.

Double ½ Vise

A hinged, spring loaded jaw gives positive hold-down action plus quick and accurate set-ups for rapid loading and unloading of jig borers, millers, planers and shapers. It is clamped and

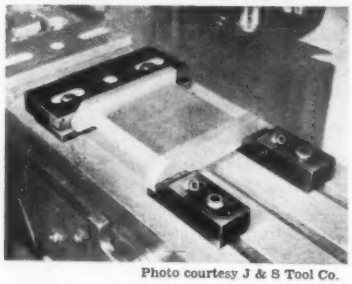
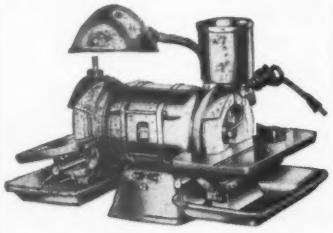


Photo courtesy J & S Tool Co.

unclamped by the simple loosening of one adjusting screw, and does away with complicated clamping arrangments and trial-and-error set-ups. It also makes for far less obstruction. The special lip action combined with that of the clamp holds the workpiece against the table with a force from ½ to 3 tons—and absolutely parallel. It eliminates complicated strap and finger set-ups on planers, and all vises on shapers.

Baldor

Carbide Tool Grinder
For Precision Work



Short wheel and bearing centers, heavy shaft, large ball-bearings, dynamically balanced armature and weight-balanced wheels provide rigidity and smoothness necessary for precision work, ½ hp, 3400 RPM reversible motor. $142.60 complete.

Mail this ad for Bulletin No. 341-B

BALDOR ELECTRIC CO.
4369 Duncan Ave. St. Louis 10, Mo.

"THE ORIGINAL"
MAUSER PRECISION VERNIER CALIPER
$14.75 PPD

NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK... IS YOUR PROTECTION.
MONEY BACK GUARANTEE FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS 1/1000" — 1/128" 1/10 mm. IN BACK
CEO SCHERR CO., INC. 200-Y LAFAYETTE ST. • N.Y. 12, N.Y.

The Green Engraver

ENGRAVES
ROUTS
PROFILES
and MODELS

Used and endorsed by tool and die, electronic, machine, plastics, radio, electrical and instrument manufacturers. A *real* money saver.

Specify the Green Engraver for precision engraving on metal, plastics, wood, glass, hard rubber etc. . . . engraves panels, name plates, scales, dials, molds, lenses, instruments, instruction plates, directional signs . . . by simple tracing from master. *Routing, profiling and three dimensional modeling indicate its versatility.* Electric etching attachment available.

Special attachments and engineering service available for production work.

FREE: Brochure yours upon request.

Green Instrument Co. INCORPORATED
380 PUTNAM AVENUE · CAMBRIDGE · MASS.

Victor's Specials Deserve Your Attention!

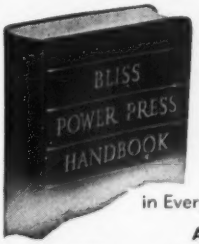
EXTRA L-O-N-G LENGTH

Straight Shank
HIGH SPEED DRILLS
Immediate Delivery

12" LONG . . . 9" CUTTING FLUTE

Size	Net	Size	Net	Size	Net
1/8	$1.65	19/64	$2.25	15/32	$3.60
9/64	1.65	5/16	2.25	31/64	3.60
5/32	1.65	21/64	2.50	1/2	3.60
11/64	1.65	11/32	2.50	17/32	4.00
3/16	1.65	23/64	2.75	9/16	4.25
13/64	1.80	3/8	2.75	19/32	4.50
7/32	1.80	25/64	3.05	5/8	4.80
15/64	1.95	13/32	3.05	21/32	5.20
1/4	1.95	27/64	3.30	11/16	5.60
17/64	2.05	7/16	3.30	23/32	6.00
9/32	2.05	29/64	3.60	3/4	6.50

VICTOR MACHINERY EXCHANGE, INC.
DEALERS IN TOOL ROOM EQUIPMENT
251 P Centre St. • New York 13, N.Y. • Phone: CAnal 6-5575



Have you bought your copy?
"One or Several Are Needed" in Every Stamping Shop—
American Machinist
700 PAGES • 450 ILLUSTRATIONS
Sections on: Computing press jobs • Selecting proper press • Useful engineering tables • Die illustrations • Complete glossary. Plus a service section for Bliss presses. $7.50.

E. W. BLISS CO. (Handbook Department)
1371 Raff Rd. S.W., Canton, Ohio
Rush me a copy of the Bliss Power Press Handbook
.....
.....
.....
I am enclosing $7.50 ☐ Bill me ☐

INFORM-A-GRAM KEY NUMBERS

In every instance the numbers listed opposite the names of our advertisers in the index below are both page numbers and INFORM-A-GRAM key-numbers

Ace Abrasive Laboratories 165B
Acme Industrial Co. 153A
Acro Metal Stamping Co. 29
Aget-Detroit Co. 152B
Alina Corporation 126D
Allegheny Ludlum Steel Corp. 133
Alpha Tool Works 89
American Measuring Instruments Corp. 154A
American Photocopy Equipment Co. 86
American Wheelabrator & Equip. Corp. 20
Arc Machining, Inc. 138C
Armstrong Brothers Tool Co. 117
Atlantic Gear Works, Inc. 124B
Austin Industrial Corporation 118

Balas Collet Mfg. Co. 7
Baldor Electric Co. 169A
Barker Engineering Co. 159A
Barnes Co., Inc., W. O. 76
Barth Stamping & Machine Works, Inc. 82
Bath Company, The Cyril 64
Benchmaster Mfg. Company 105
Big Joe Manufacturing Co. 125A
Black Drill Company, Inc. 167C
Bliss Company, The E. W. 169E
Bloomfield Tool Corporation .....136F & 144E
Bokum Tool Company 165C
Boyar-Schultz Corporation 156A
Brown & Sharpe Mfg. Company 65
Burg Tool Mfg. Co. 40
Buck Tool Company 120

Cadillac Stamp Company 100
Carboloy-Dept. of Gen. Electric Co. 17
Carborundum Company, The 125C
Carpenter Steel Co., The 139B
Chicago Screw Company, The 162C
Cincinnati Milling Machine Co., The 61
Cincinnati Shaper Company, The 6
Clausing Div., Atlas Press Co. 77
Clark Equip. Co., Industrial Truck Div. 35
Clark Instrument, Inc. 155C
Clinton Machine Co. 128A
Colonial Bushings, Inc. 161A
Columbia Tool Steel Company 146B

Danly Machine Specialties, Inc. 25
Dayton Rogers Mfg. Co. 140C
Delta Power Tool Division, Rockwell Mfg. Company .....67 & 83
Detroit Die Set Corporation 95
Detroit Power Screwdriver Company 110
Detroit Stamping Co. ..... 148C, 152D & 160A
DeVlieg Microbore Company 31
DeWitt Equipment Company 144A
Dickerman Manufacturing Co., H. E. 90
Die Supply Company, The 108
Douglas Tool Co. 139A
Dreis & Krump Manufacturing Co. 147C
Dumore Company, The 173
Durant Tool Supply Company 125B
Dykem Company, The 126E

Eisler Engineering Company, Inc. 168F
Electro-Mechano Company 165A
Elgin National Watch Company 23
Elox Corporation of Michigan 168B
Enco Manufacturing Company 129B
Engineering Research Assoc., Inc. 161C
Erickson Tool Company 33
Ex-Cell-O Corporation 43

Famco Machine Company 141B
Ford, M. A. 134A
Fonda Gage Company 99
Foredom Electric Company 161D
Foster Supplies Company 162B
Fray Machine Tool Company 94

Gage Company 134C
Gairing Tool Company, The 93
Gatco Rotary Bushing Company 150B
Genales, Andrew 148D
General Die & Stamping Co. 168G
Gorton Machine Co., George 9
Grand Tool & Supply Co. 166B
Graymills Corporation 142A
Green Instrument Company 169D
Grobet File Co. of America, Inc. 126B

Hamilton Tool Company, The .....114 & 115
Hammond Machinery Builders, Inc. 96
Handy Products 32
Hardinge Brothers, Inc. 22
Heimann Mfg. Company 166D
Heinrich Tools Inc. 153C
Heuser Mfg. Company 144D
Holliday & Company, W. J. 84
Hovis Screwlock Company 109
HPL Mfg. Company 126A
Huebner Publications, Inc. .....38 & 165D
Hupp Corporation 119
Hutchinson Co., Wm. T. 126C

Index Machine Company 102

Jergens Company, J. G. 155A
Jergens Tool Specialty Company 44
Johnson Gas Appliance 164B
Johnson Manufacturing Corporation 116
Jones & Lamson Machine Company 21

Kase Machine Company 136E
Kearney & Trecker Corporation, The Special Machinery Division 5
Kennametal, Inc. 72

Lamina Dies & Tools, Inc. 174
Lapeer Mfg. Company 147A
Last Word Sales Company 150A
Latrobe Steel Company 13
Lavalle & Ide, Inc. 4
Lectrotech Company, The 171A
Lee Company, K. O. 137B
Lempco Products, Inc. 36
Levin & Son, Inc., Louis 149C
Lincoln Park Industries, Inc. 75
Lodding, Inc. 63
Lucas & Son, Inc., J. L. 142D

Madison Kipp Corporation 147D
Manzel 137A
Meyers Company, Inc., W. F. 153D
Michigan Chrome & Chemical Co. 144B
Micromatic Hone Corporation 167A
Miller Motor Company 16
Milne & Company, A. 71
Montgomery & Company, Inc. 128B
Moore Special Tool Company 27
Morey Machinery Company, Inc. 123
Morton Machine Works 149D
Motch & Merryweather Machinery Co., Inc. ..78

Neise, Karl A. ..... 147B & 168D
Newcomer Products, Inc. 171C
New-Field Machined Parts Co. 163
Nichols-Morris Corporation 106
Nicholson File Company 69
Nilsson Gage Company, Inc. 146A
Norton Company 14
Northwestern Tool & Engineering 168H

Oliver Instrument Company 138A
O K Tool Co., The 154B
O'Neil-Irwin Manufacturing Co. 42

Parker-Kalon Corporation 12
Parker Machine Company, Inc. 91, 124A & 167B
Parker Stamp Works, Inc. 140A
Perfex Gage & Tool Company 160B
Perkins Machine Company 111
Pittsburgh Tool Steel Wire Co. 41
Pope Machinery Corporation 34
Porter Precision Products 92
Pratt & Whitney, Div. Niles-Bement-Pond Company 10
Precise Products Corporation 145A
Preis Engraving Machine Co., H. P. 136D
Production Devices, Inc. 154D
Putnam Tool Company 3

Raymac Mfg. Company, Inc. 161B
R. B. Tool Company, Inc. 129A
Reich Mfg. Co., J. R. 136C
Reid Tool Supply Company 138B
Reltool Corporation 140B
Rice Pump & Machine Company 168A
Richards Company, J. A. 152C
Rimat Tool Company 152A
Ring Punch & Die Company 134B
Robbins Company, Omer E. 167D
Roll-Feeds Corporation 168C
Rotor Tool Company, The 37

Sales Service Machine Tool Co. 24
Scherr Company, Inc., George .....153B & 169B
Scully-Jones & Company 79
Service Machine Company 166A
Severance Tool Industries, Inc. 148B
Shearcut Tool Co. 149B
Sheffield Corporation, The 2
Sheldon Machine Company 104
Sheridan Products 171B
Shore Instrument & Mfg. Co. 138D
Sid Tool Company, Inc. .....121 & 142C
Simmonds Abrasive Company 28
South Bend Lathe 145B
Standard Electrical Tool Company 101
Standard Gage Company, Inc. 18
Standard Parts Company 130
Standard Pressed Steel Company 26
Star Stainless Screw 155B
Steel Products Engineering Co. 85
Stocker & Yale, Inc. 122
Strand Company, Ed. D. 168E
Sturtevant Company, P. A. 144C
Super Tool Company 103
Superior Indicator Company 168J
Superior Steel Products Corp. 39
Sutton Tool Company 87
Swedish Gage Co. of America 166C

Tannewitz Works, Inc. 162A
Thermo Electric Manufacturing Co. 143B
Tietzmann Tool Corp. 141A
Timken Roller Bearing Co., Steel & Tube Div. 19
Tomco Products Co. 136A
Tomkins-Johnson Company, The 107
Torit Mfg. Co. 98
Tubular Micrometer Company 159B
Twentieth Century Mfg. Company 155D

U. S. Tool Company Inc. 73
Universal Engineering Company 149A

Verson Allsteel Press Company 30
Victor Machinery Exchange, Inc. 169C
Vlier Manufacturing Company 97
Vulcan Tool Company 113

Walls Sales Corp. 142B
Ward Machinery Company 143A
Wardwell Mfg. Co., The 164A
Watts Bros. Tool Works 154C
Webber Gage Company, The 8
Weldon Tool Company, The 156B
Wells Mfg. Company 127
Wesson Company, Affiliated with Wesson Metal Corp. 46
Wesson Metal Corp., Affiliated with Wesson Company 81
West Point Mfg. Company 112
Whistler & Sons, Inc., S. B. 1
Woodson Tool Company 148A

Yost Manufacturing Company 136B

Zagar Tool, Inc. 74

ADVERTISERS INDEX

DUMORE DRILL HEADS cut small hole drilling cost 75% . . . multiply production 4 times!

Foot treadle leaves operator's hands free for loading and unloading jig. Drill Heads are used in tandem, drill .086" dia. holes with No. 44 drill. Material is 0-25 Armco Zinc-grip.

Metal window manufacturer drills 600,000 holes yearly with these amazing tools!

THE world's largest manufacturer of all-metal combination screen and storm sash installed 2 Dumore Automatic Drill Heads . . . got these almost incredible results. (1) 600,000 instead of 150,000 holes drilled per 2000-hr. shift-year. (2) Cost per 1000 holes decreased from $23.00 to $5.60. (3) Drill breakage reduced to the point where savings paid for the Drill Heads in 13 months.

And the most amazing thing about this report is that it is not an isolated case. In fact, increased output and similar savings on costs of production, scrap loss, and down-time, are being effected in practically every instance where Dumore Automatic Drill Heads have been installed. As this manufacturer says, "They are a 'natural' for multiple drilling operations."

To get an idea of how these amazing tools can help you improve your production and cut your costs, see your industrial distributor, or write:

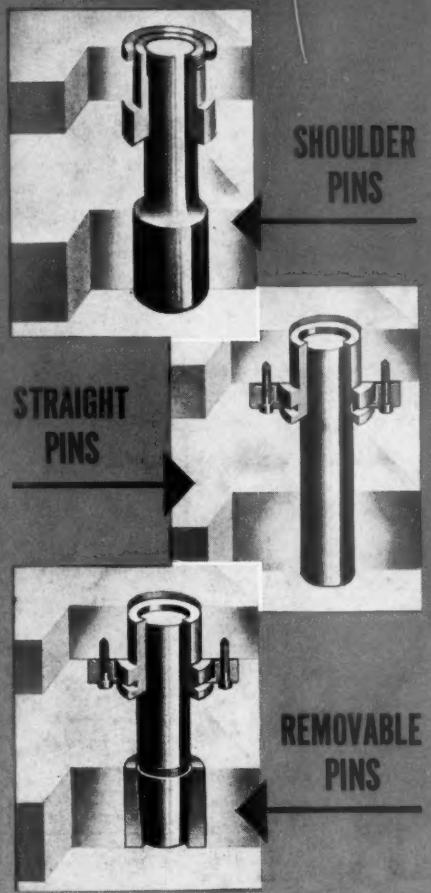
THE DUMORE COMPANY

1313 Seventeenth Street • Racine, Wisconsin

for boosting die output—

and reducing maintenance

Lamina WATER-HARDENING STEEL GUIDE PINS



Lamina Guide Pins give exceptional service, too. Made of water-hardening tool steel and precision lapped on the O.D., these quality pins not only wear longer but perform better. They completely eliminate the brinelling and "mushrooming" characteristic of case hardened pins when they are driven into the shoe. Note, too, the improved design of the removable pins which simplifies installation.

DISTRIBUTORS: A few desirable territories are open to qualified distributors. If interested, please write for details.

PATENT PENDING

Lamina Guide Pin Bushings are hardened steel with bronze electroplated on the inside diameter . . . it's the one bushing design that gives you the long wear life of hardened steel with complete freedom from seizing and scoring. Added to the free-running qualities of the bronze bearing surface, a double figure-eight oil groove keeps the pin and bushing properly lubricated at all times.

Lamina Guide Bushings are made in two styles illustrated above and in a number of diameters and lengths. As shown at the left they can be used with straight, shoulder and removable type pins. For longer press runs with fewer shut-downs, specify Lamina Guide Pins and Bushings.

Lamina Dies and Tools, Inc., 14925 W. Eleven Mile Road, Berkley, Michigan.

This new brochure gives complete information and sizes on Lamina Guide Pins and Bushings. It also illustrates many other Lamina dies, tools and die-maker's equipment. Send for your copy, there is no obligation.

Lamina DIES AND TOOLS

2747 (15)

with
's the
life of
g and
ronze
keeps
times.

illus-
ngths.
aight,
s runs
ns and

leven